



# **Armed Forces College of Medicine AFCM**



# ***Lung and Pleura***

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***Lecturer of Anatomy***

# ***INTENDED LEARNING OBJECTIVES (ILO)***



**By the end of this lecture the student will be able to:**

1. Define the pleura, its layers & parts.
2. Describe the nerve, blood supply, lymphatic drainage & surface anatomy of the pleura.
3. Recognize the related relevant clinical problems to the pleura
4. State the stages of development of the respiratory tract & list the possible congenital anomalies.
5. Describe the shape, surfaces, borders of each lung.
6. Compare between right and left lungs regarding root, lobes, fissures, relations.
7. Define the bronchopulmonary segments and realize their clinical importance.
8. Describe the blood, nerve supply, lymphatic drainage and surface anatomy of the lung

# ***Pleura***



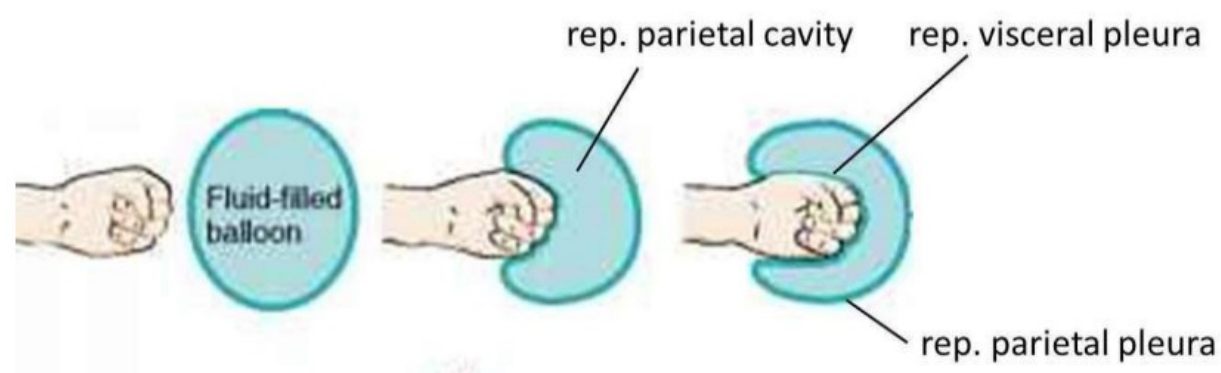
**Pleura is a serous sac surrounding the lung it is , formed of 2 layers visceral and parietal**

***Parietal pleura:*** superficial layer lining the wall of the thoracic cavity.

***Visceral pleura:*** deep layer adheres to the lungs

***The Pleural cavity:***

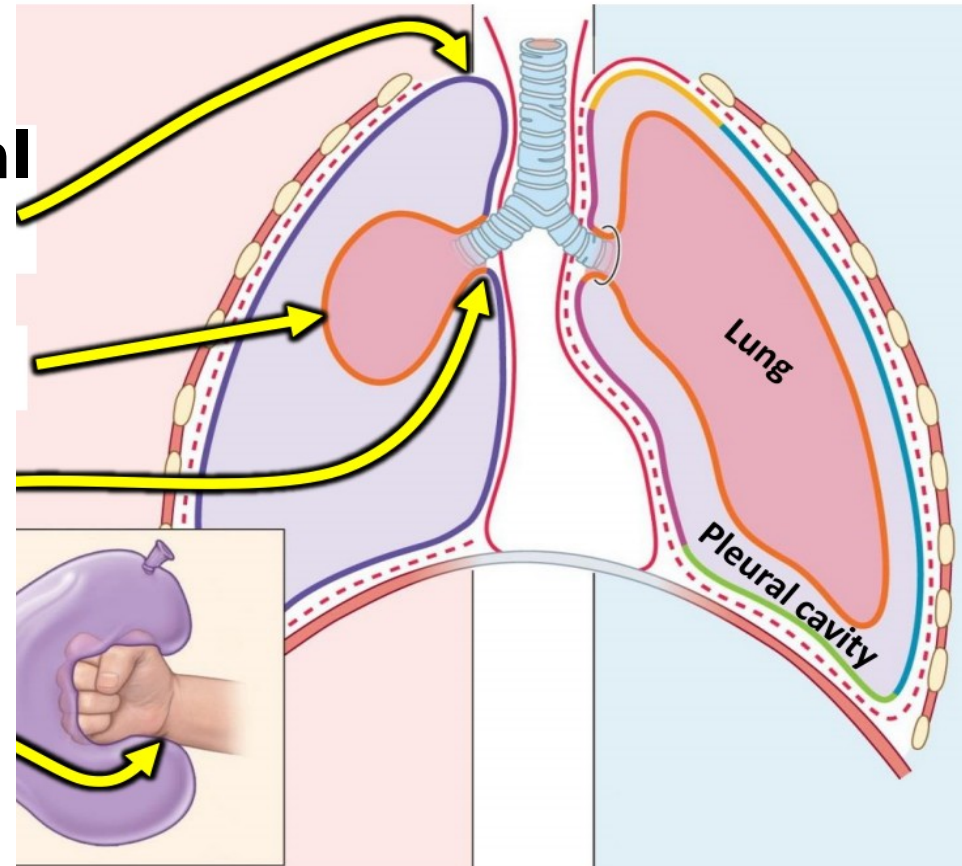
small space between the visceral and parietal pleurae. It contains a small amount of lubricating fluid (Pleural fluid) secreted by the two layers.



# ***Pleural cavity***

**Parietal  
pleura**

**Visceral  
pleura**



# ***Parts of parietal Pleura***



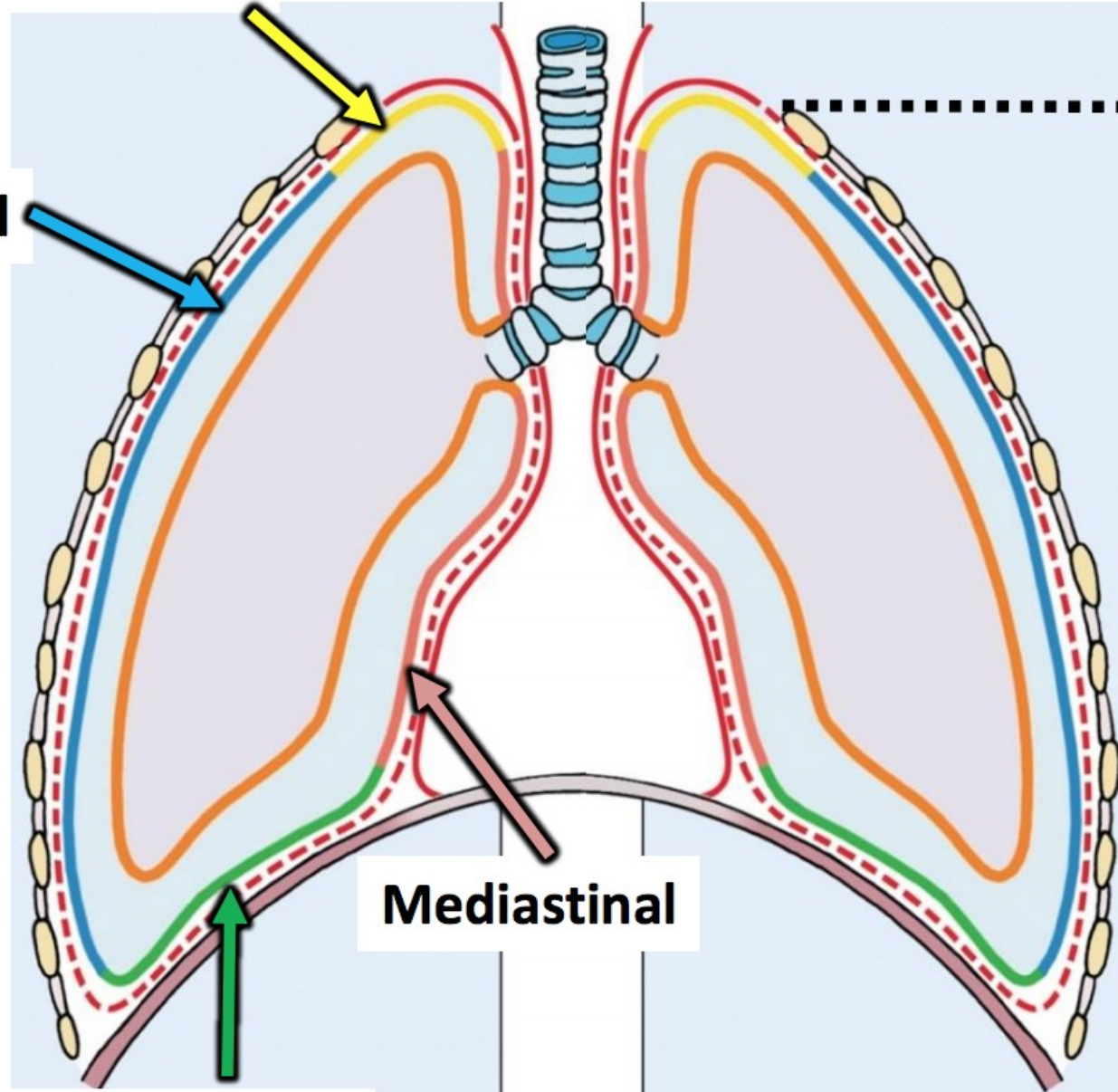
- 1. Costal part:*** covers the internal surface of the thoracic wall
- 2. Diaphragmatic part:*** covers the superior surface of the diaphragm.
- 3. Mediastinal pleura:*** covers the lateral sides of the mediastinum.
- 4. Cervical part:*** covers the apex of the lungs

***Injuries to the base of the neck can affect lungs and pleura because cervical pleurae extends 2 - 3 cm. above medial end of clavicle.***

**Cervical (cupula)**

the base of the neck through the

**Costal**



**Mediastinal**

**Diaphragmatic**



# Pleural Recesses

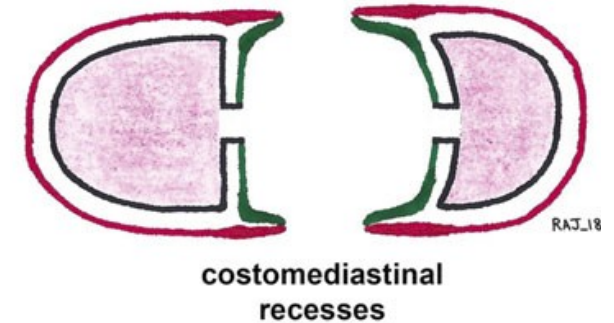


They are ***Areas of pleural cavities*** that are ***occupied by the lungs during deep inspiration***

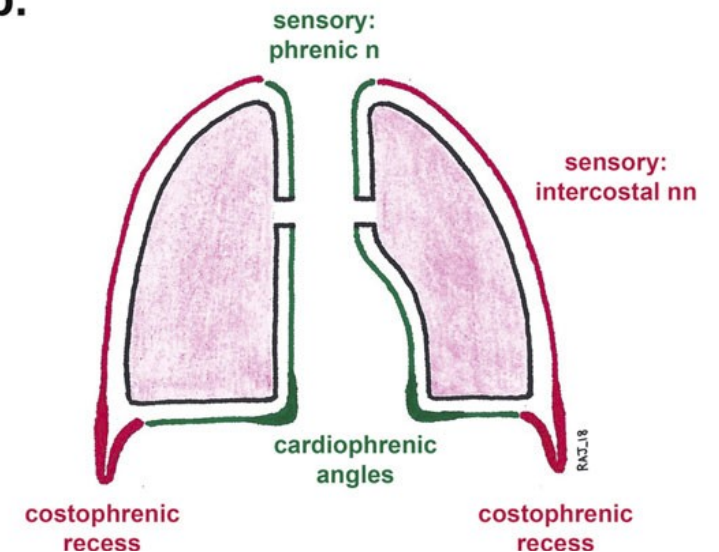
**Two recesses are:**

***1. Costomediastinal recess***

***2. Costodiaphragmatic recess.***



b.





# ***Nerve Supply of the Pleura***



	<b>Parietal pleura</b>	<b>Visceral pleura</b>
<b>■ Nerves</b>	<p><b>1- Intercostal nerves (supply costal &amp; peripheral parts of diaphragmatic pleurae)</b></p> <p><b>2- Phrenic nerve (supply mediastinal &amp; central parts of diaphragmatic pleurae)</b></p> <p>■ Sensitive to pain</p>	<p>■ Autonomic</p> <p>■ Insensitive to pain</p>
<b>■ Arteries and veins</b>	<p>■ Intercostal, internal thoracic, musculophrenic</p>	<p>■ Bronchial vessels</p>

**Inflammation of the parietal pleura produces severe pain (pleurisy)**

# ***Surface Anatomy of Pleura***



- ***Cervical pleura:***

Anteriorly, 1.5-2.5 cm above the sternal end of the clavicle.

Anterior margin extends obliquely behind the sternoclavicular joint.

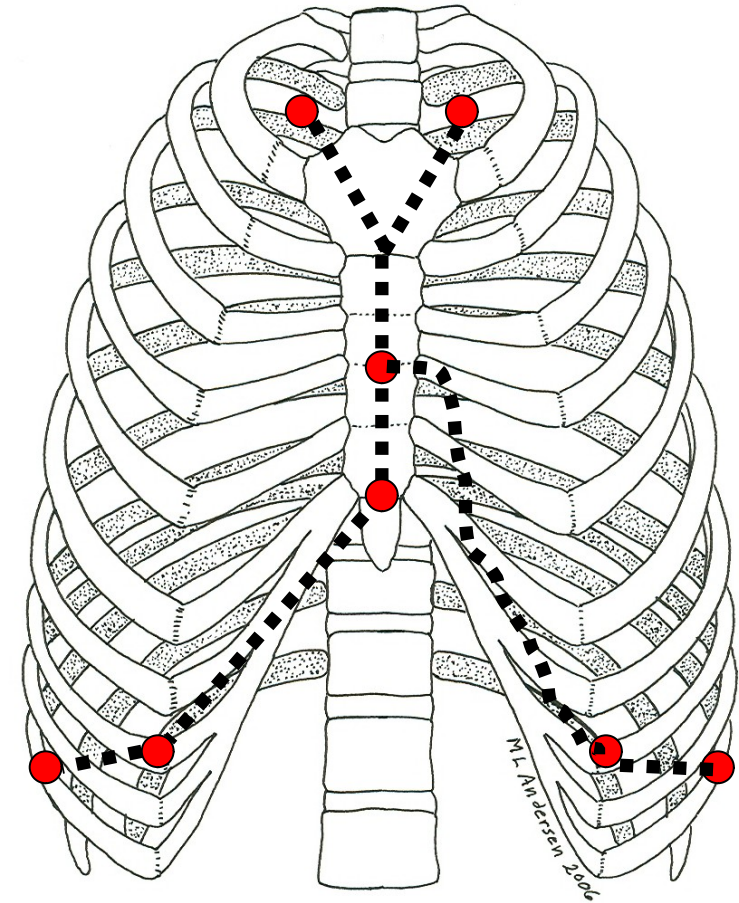
- ***At sternal angle***, the pleura remains in the median line and two sides stay in contact until the 4<sup>th</sup> costal cartilage.
- ***At this level, the left pleural margin shifts to the left side and descends till the 6<sup>th</sup> costal cartilage***

# ***Pleural Surface Anatomy***



- ***Right side:***

- Leaves sternum at 6<sup>th</sup> costal cartilage.
- At 8<sup>th</sup> costal cartilage at midclavicular line.
- At 10<sup>th</sup> rib at midaxillary line.
- Extends to level of body of T12 and then ascends upward.

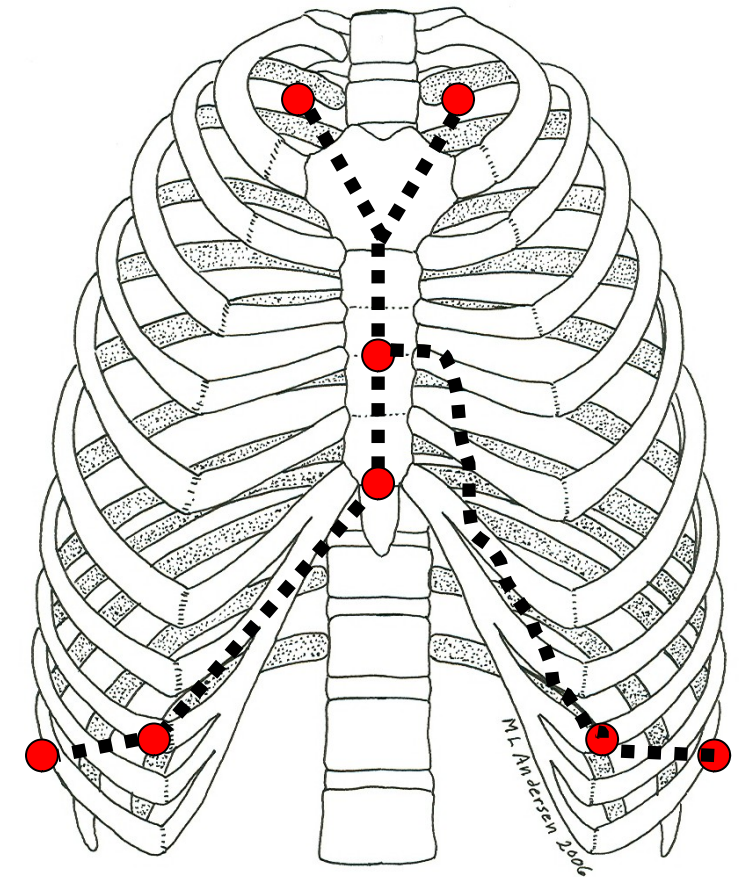


# ***Pleural Surface Anatomy***

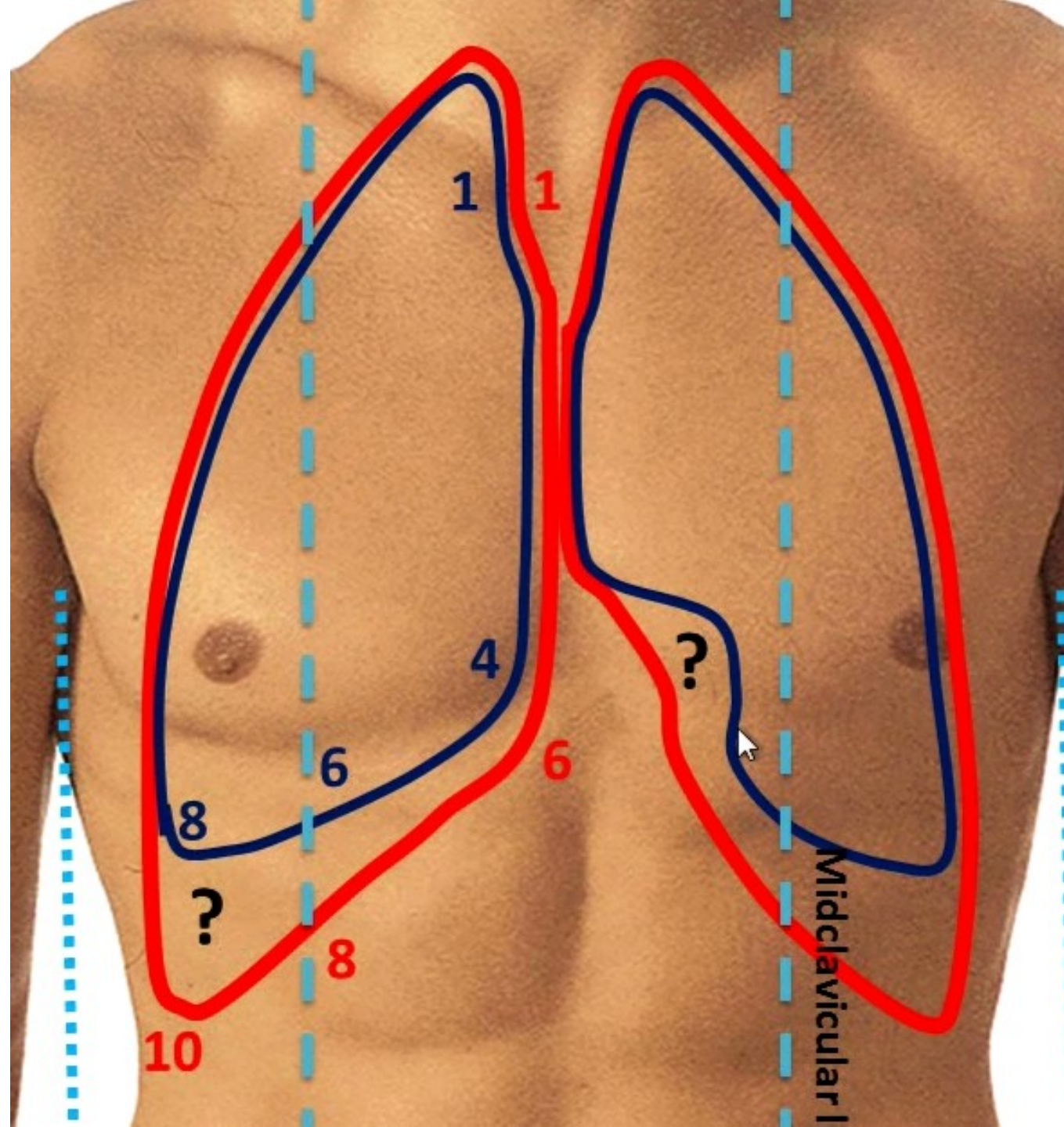


- ***Left side:***

- Leaves sternum at 4<sup>th</sup> costal cartilage
- 1.5 cm from sternal margin at 6<sup>th</sup> costal cartilage.
- Follows same landmarks as right side from this point.



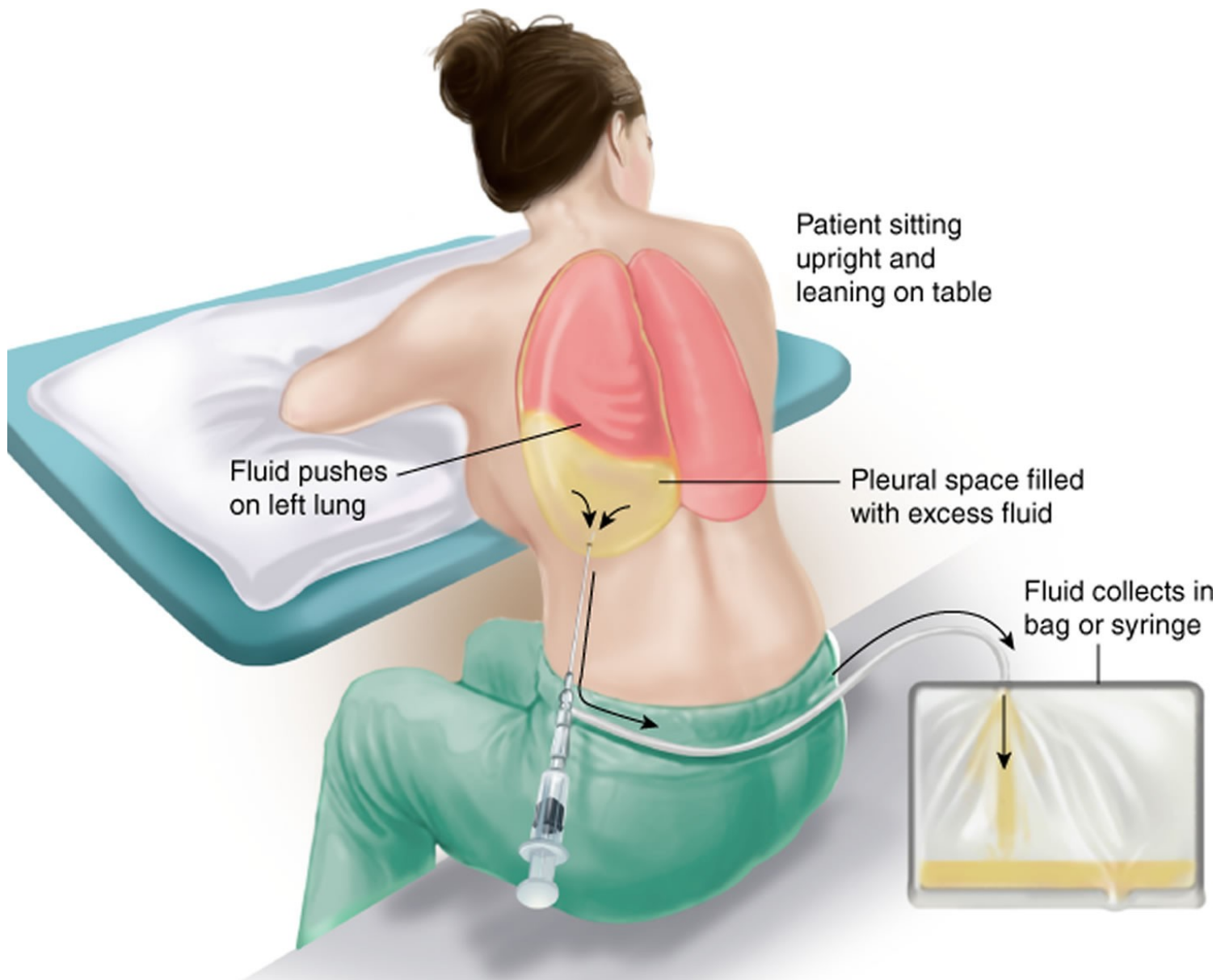
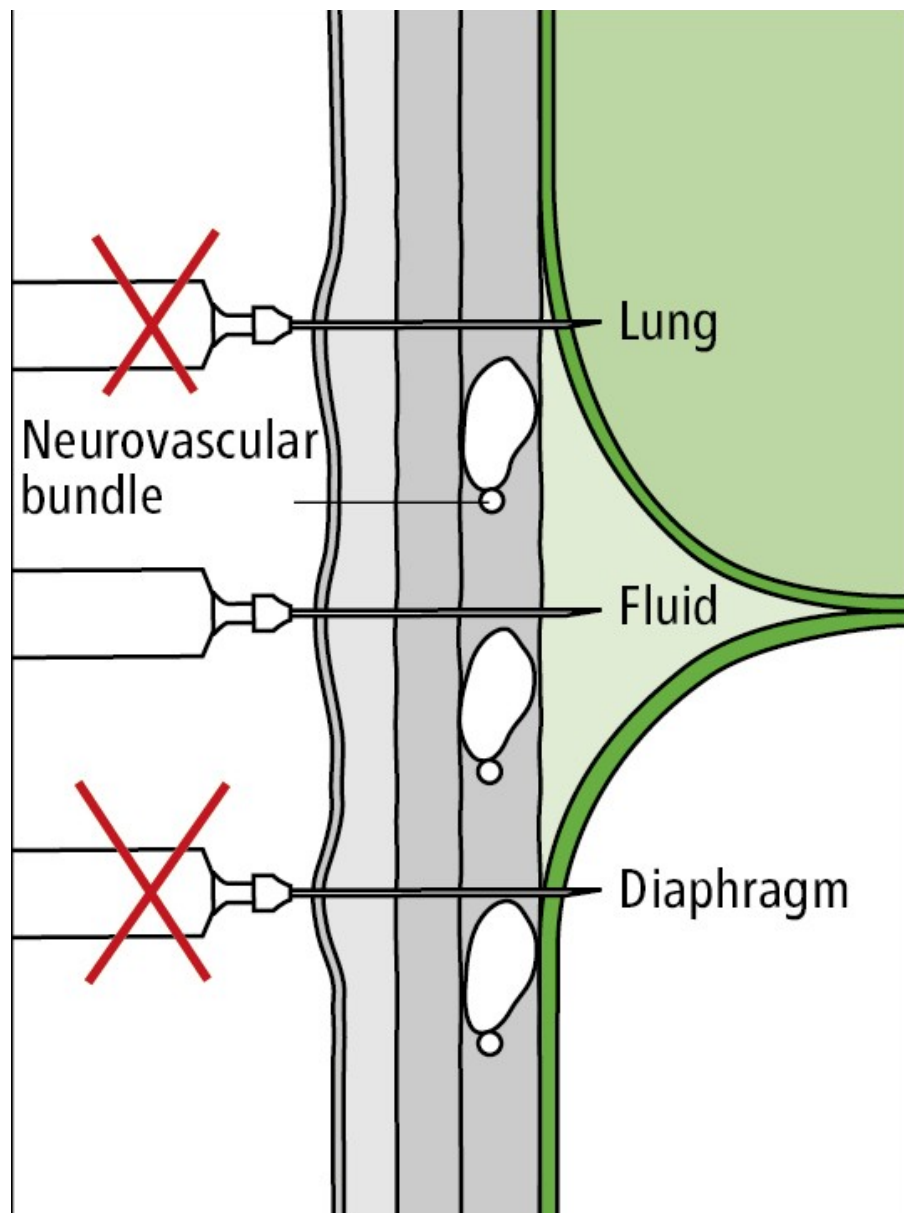




# ***Clinically .....***



- **Fluid** accumulation in a pleural cavity is called ***pleural effusion (Hydrothorax)***.
- **Air** accumulation in a pleural cavity is called ***Pneumothorax***.
- **Blood** accumulation in a pleural cavity is called ***Hemothorax***.
- **Pus** accumulation in a pleural cavity is called ***Empyema***
- Aspiration of any fluid from the pleural cavity is called ***Thoracocentesis***.
- It is usually done in the 6<sup>th</sup> – 7<sup>th</sup> – 8<sup>th</sup> intercostal space in the midaxillary line
- The needle is passed through the lower part of the space to avoid injury to the neurovascular bundle.





# ***Lecture Quiz***



**Lower border of the left pleural sac meets midclavicular line at**

**A. 6<sup>th</sup> rib**

**B. 8<sup>th</sup> rib**

**C. 10<sup>th</sup> rib**

**D. 12<sup>th</sup> rib**

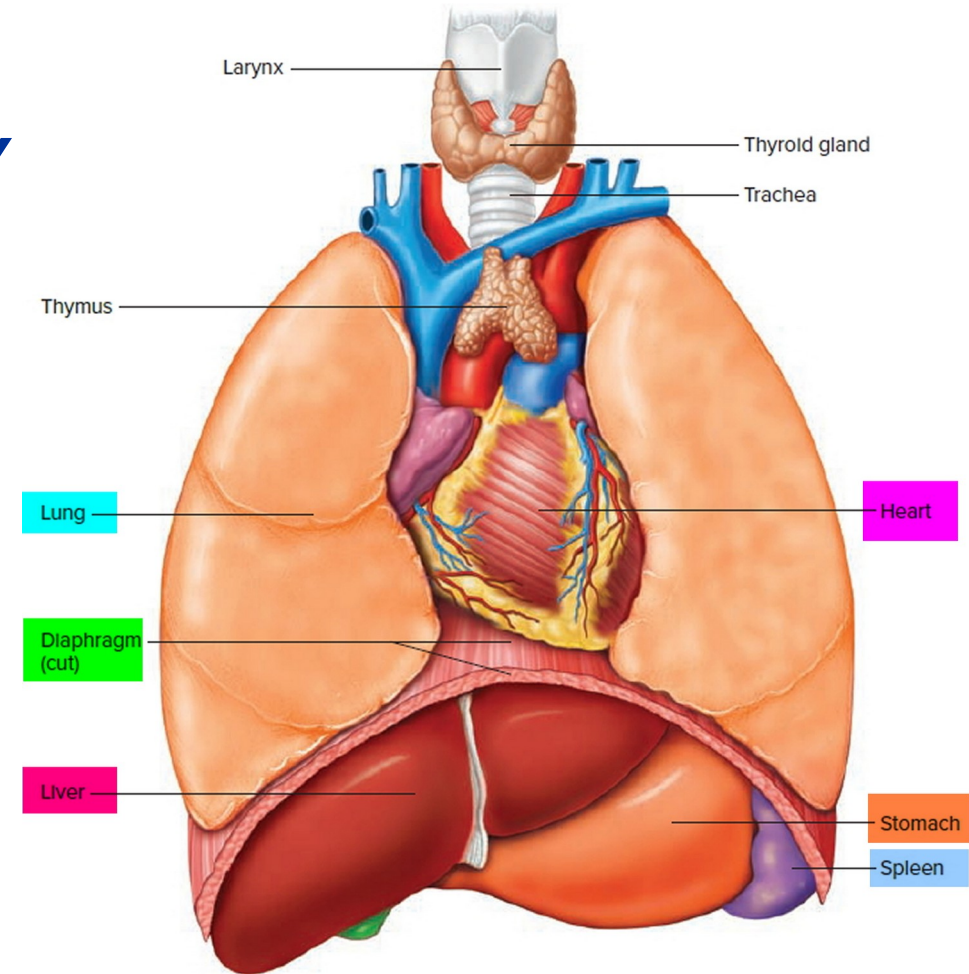
# Lungs



The lungs are **soft, spongy** and **very elastic**.

In a child, lungs are **pink** in color. Gradually, they become **mottled and black** because of inhaled carbon particles.

The right lung weighs about 700g. It is about 50- 100g heavier than the left lung.



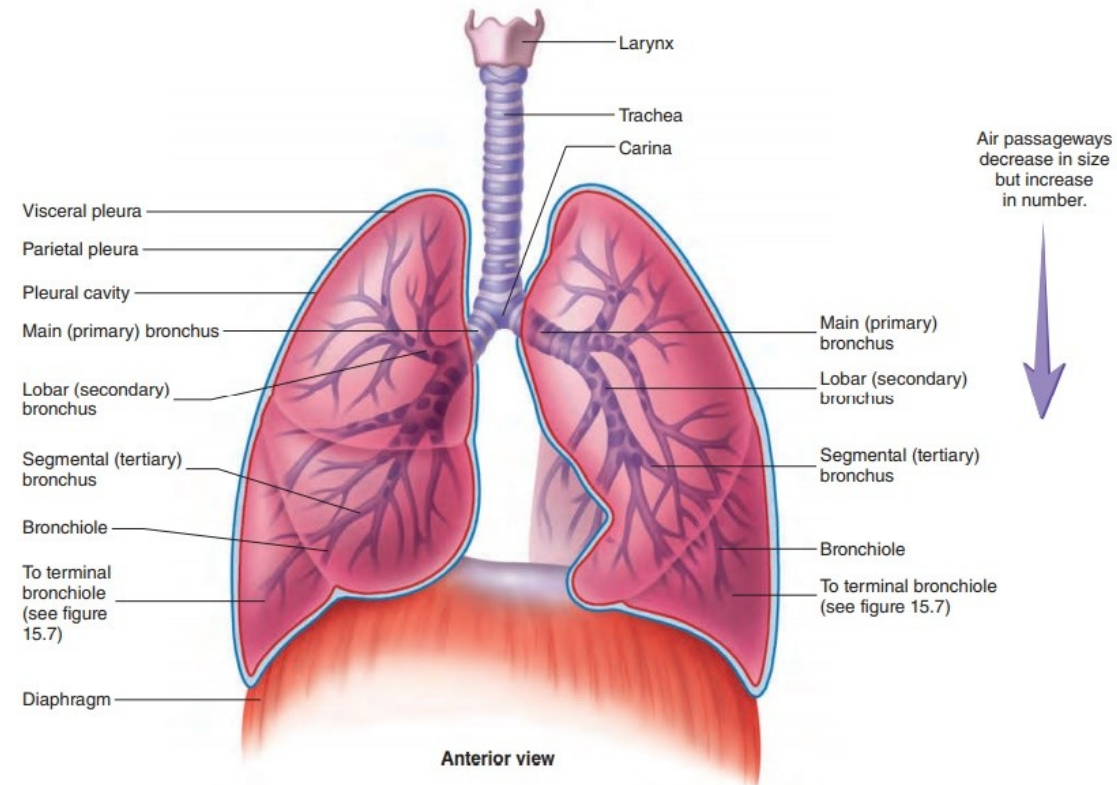
# Anatomy of the Lungs



**Each lung** has conical shape with an ***apex***, ***base***, ***two surfaces*** and ***three borders***

## ***Apex***

Projects upward into the neck for about 1 in. (2.5 cm) above the clavicle.

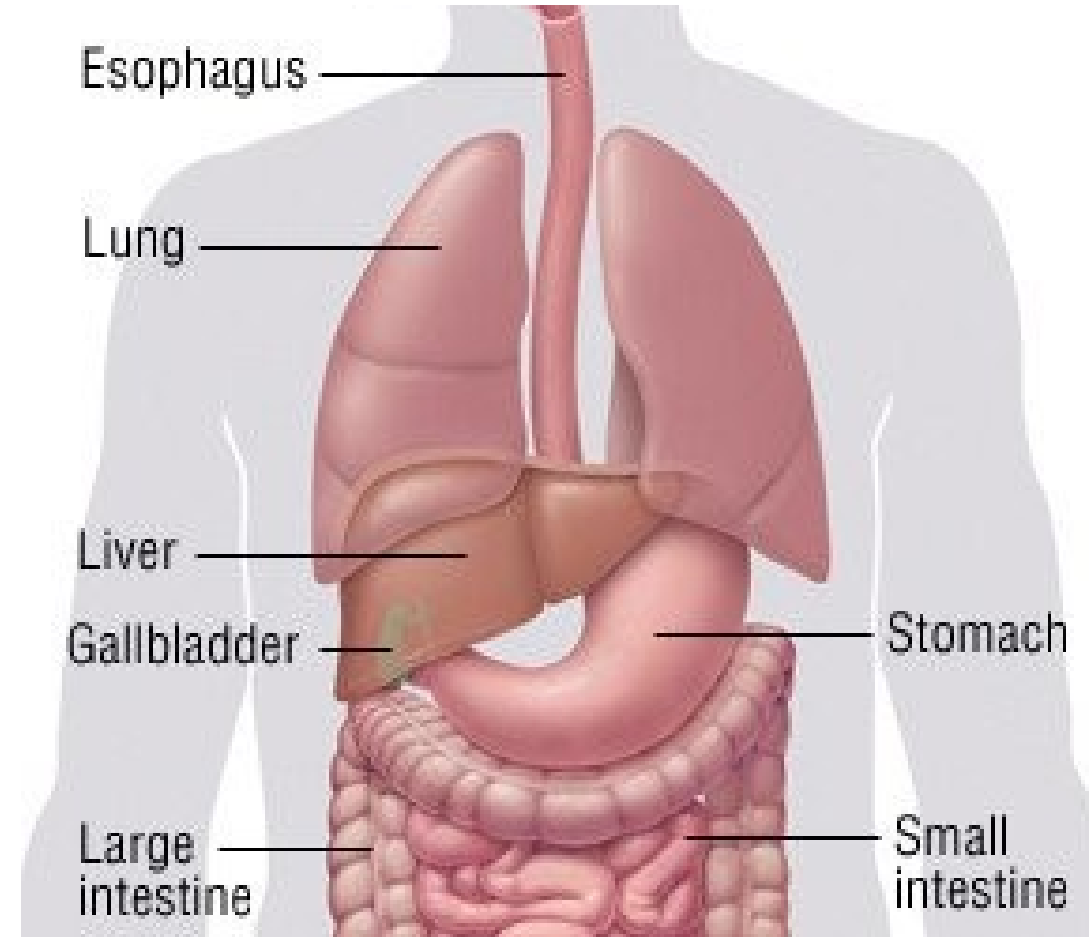


# ***Anatomy of the Lungs***



## ***Base (diaphragmatic surface) that:***

1. Rests upon the upper surface of the diaphragm
2. The diaphragm separates the right lung from the liver on the right side and separates the left lung from the spleen and stomach.



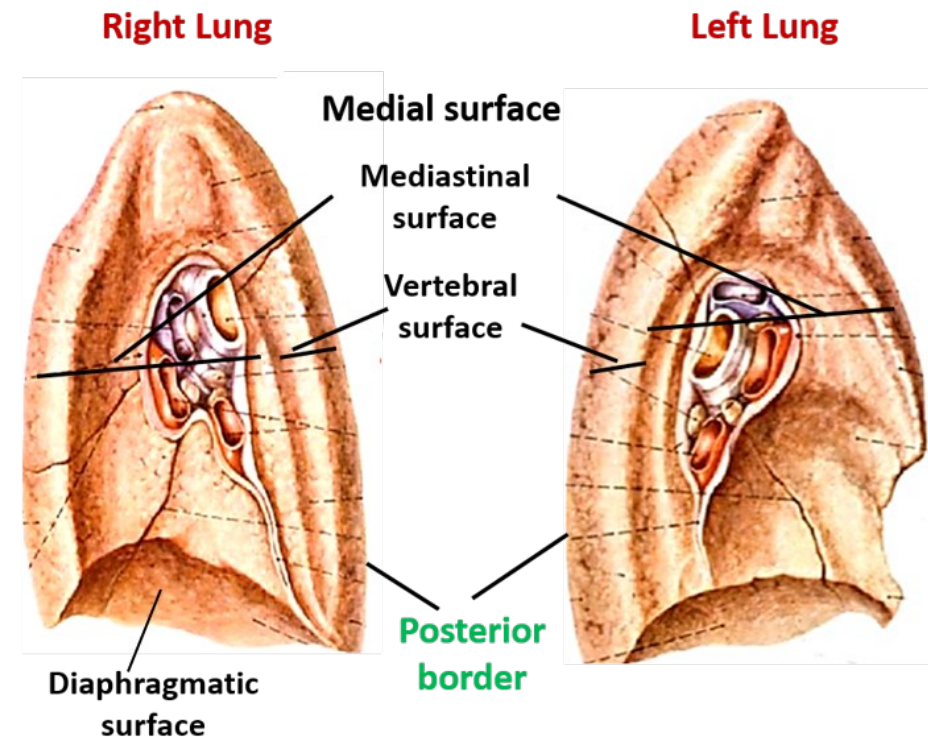
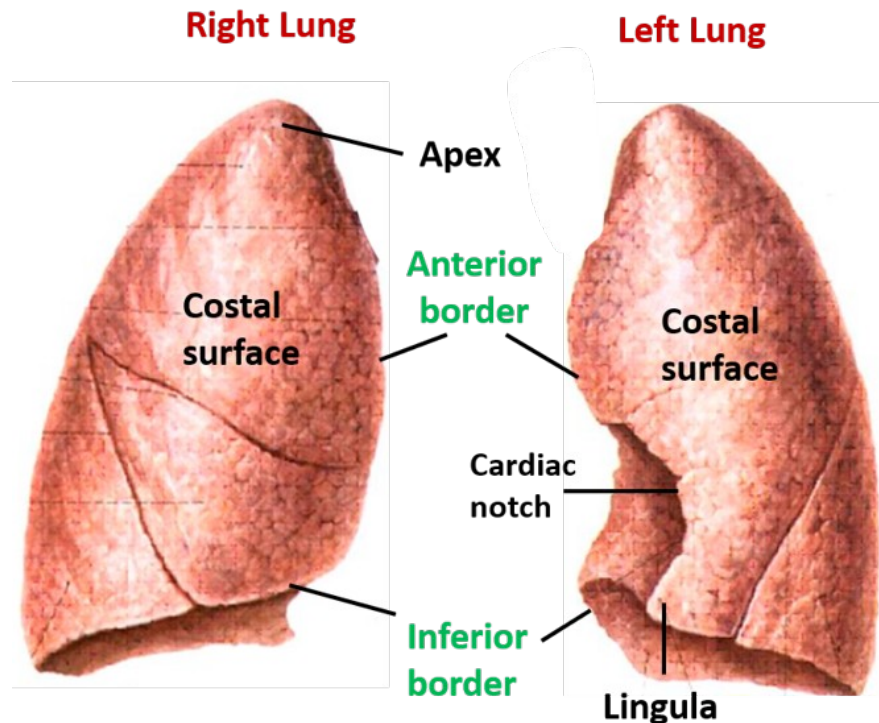
# Anatomy of the Lungs



**Two surfaces** (Costal and medial)

**The costal surface** is convex, adjacent to the ribs and intercostal spaces.

**The medial surface**, related to the mediastinum.





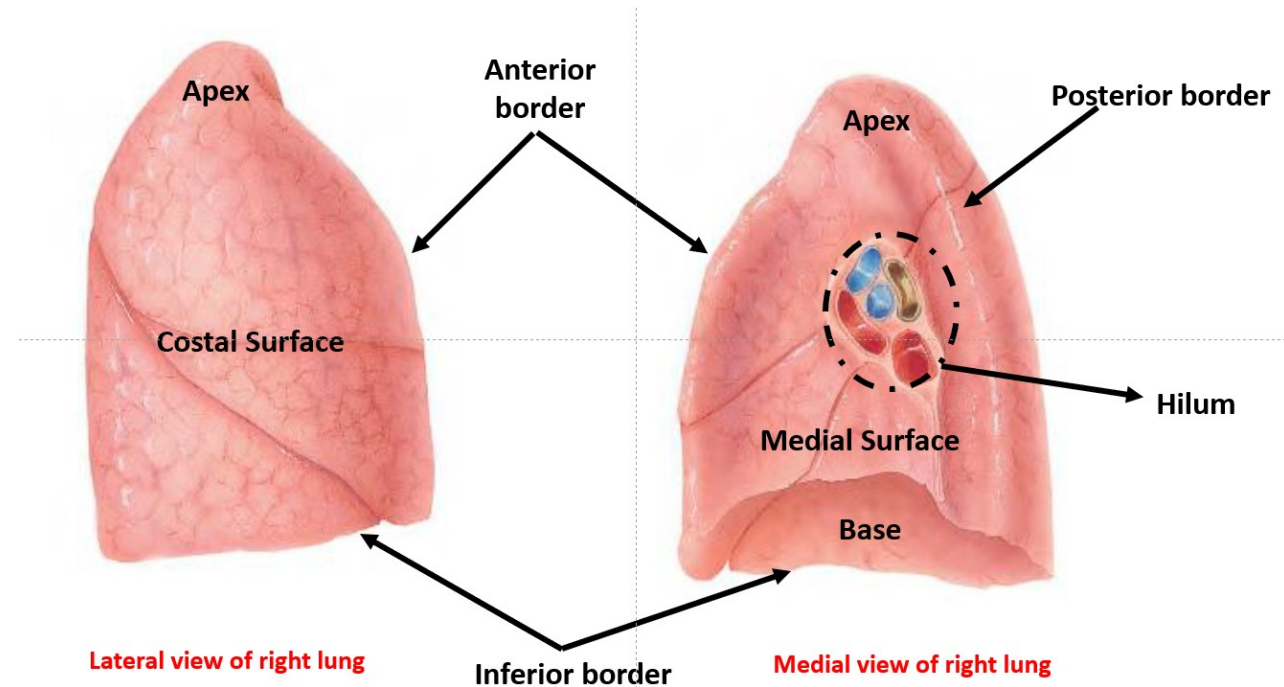
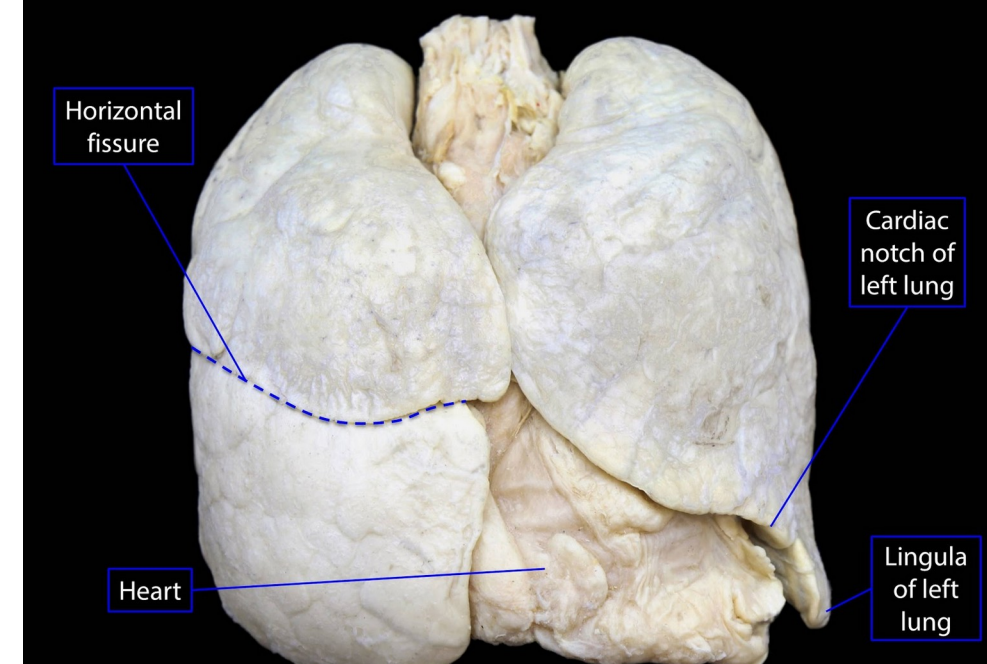
# Anatomy of the Lung

## **Three borders**

**Anterior, posterior, and inferior**

### ➤ Anterior border:

- Sharp
- on the left side shows the cardiac notch and a projection called Lingula.



# Lung Fissures & Lobes



The right lung is slightly larger than the left lung and divided by the oblique and horizontal fissures into three lobes: **the upper, middle and lower lobes.**

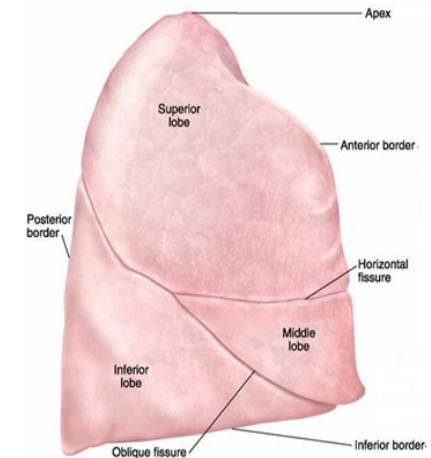
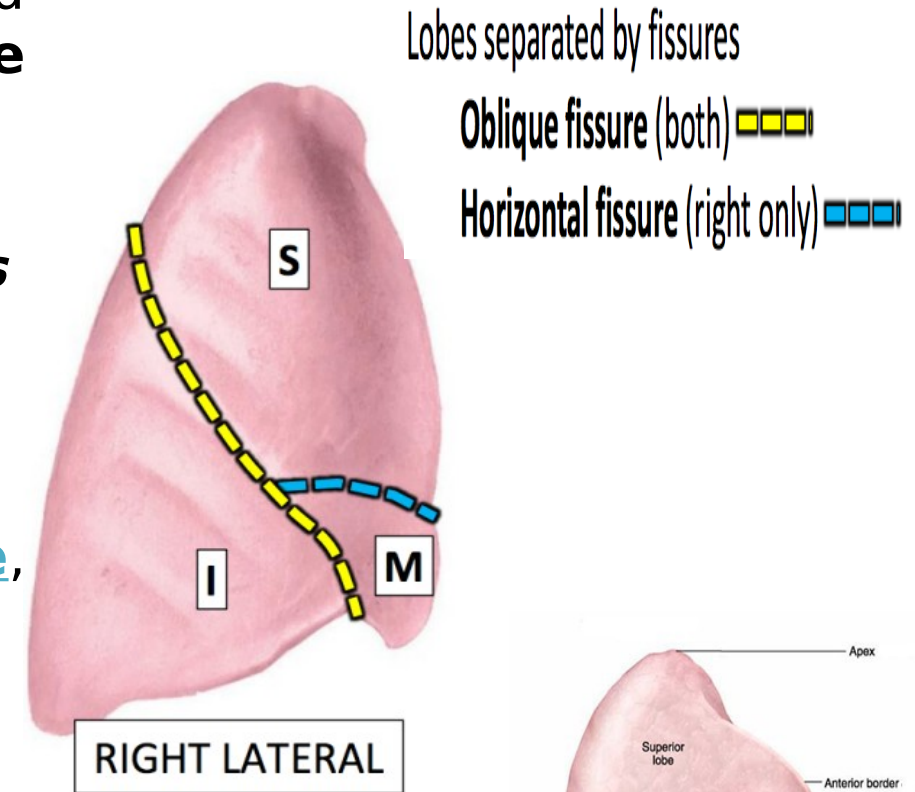
left lung has only 1 fissure (Oblique fissure) and **2 lobes (upper - lower).**

## The oblique fissure

Represented by a line drawn from 3<sup>rd</sup> thoracic spine, downward to 6<sup>th</sup> CC.

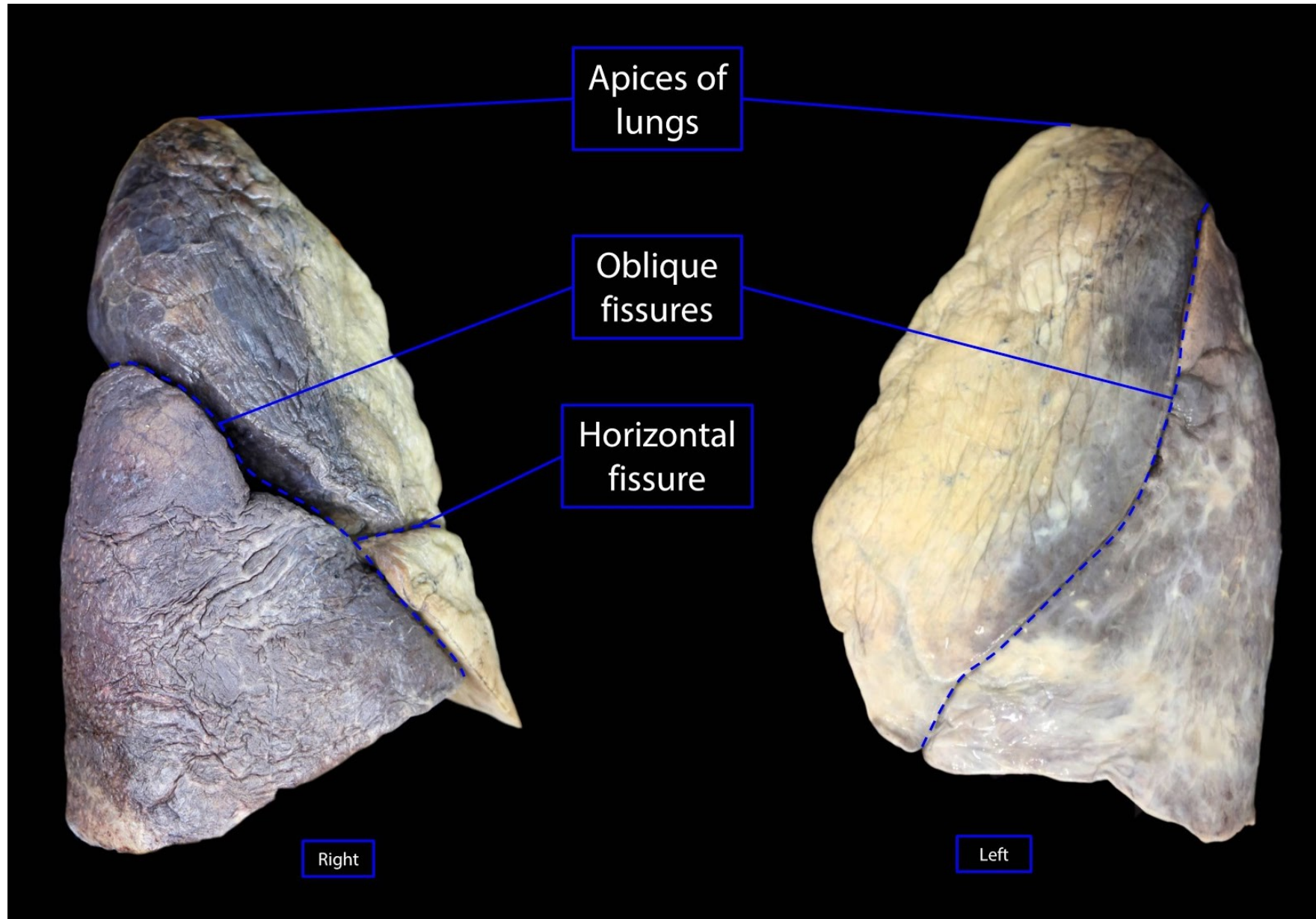
## The horizontal fissure

Presented by a line drawn passing horizontally from 4<sup>th</sup> CC till meeting the oblique fissure





# ***Lobes and fissures of the Lung***



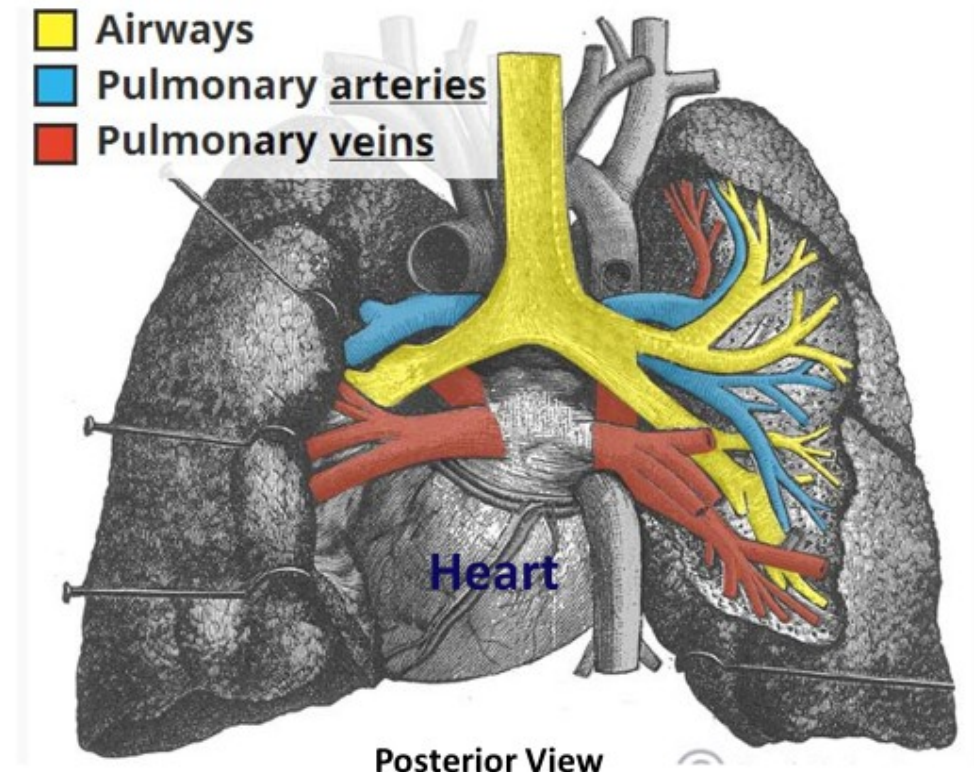
# Root and Hilum of the Lung



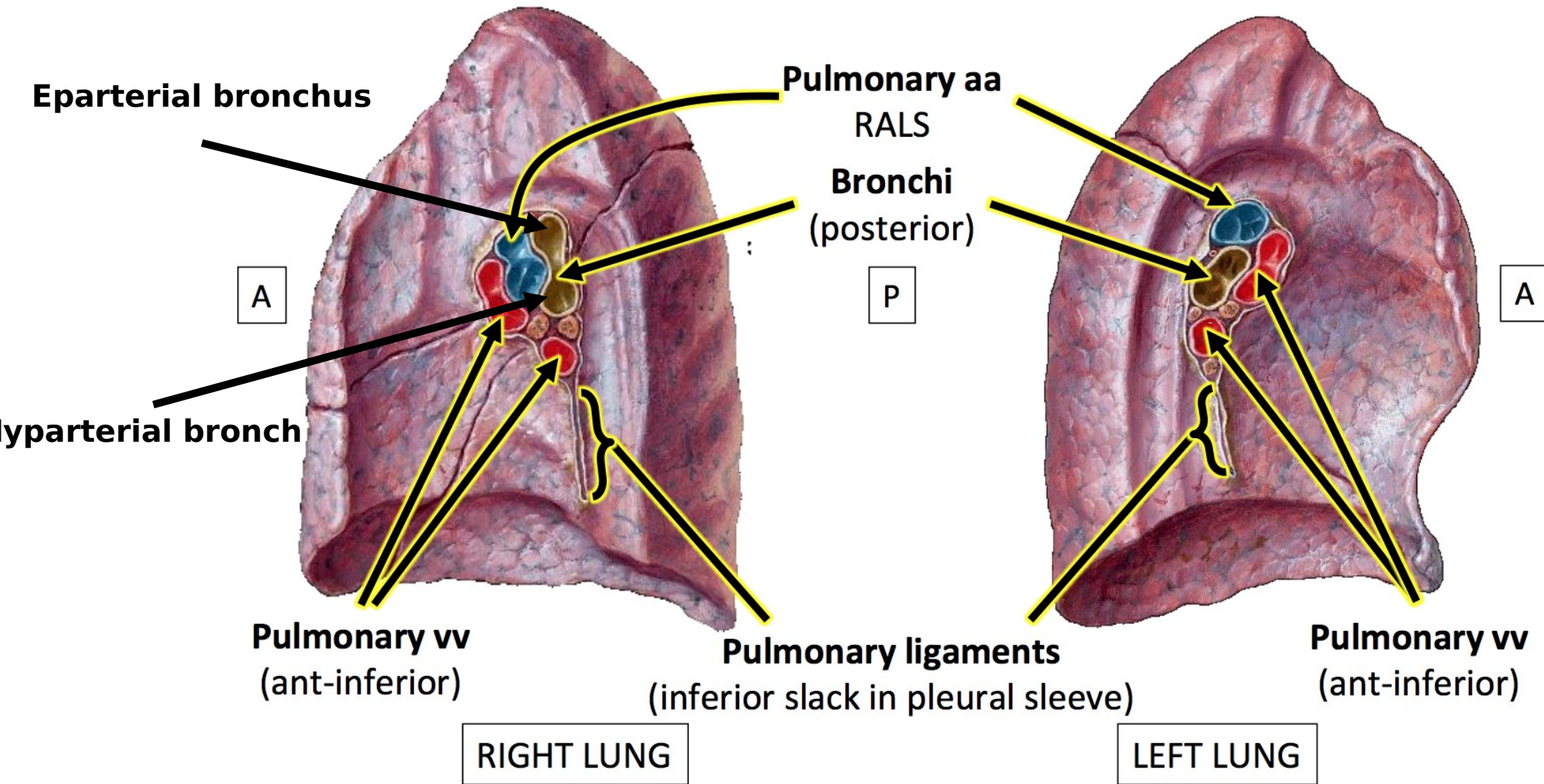
Lung roots lie opposite to **T5-T7** vertebrae.

**The hilum** is the area through which the structures enters or leaves the lung

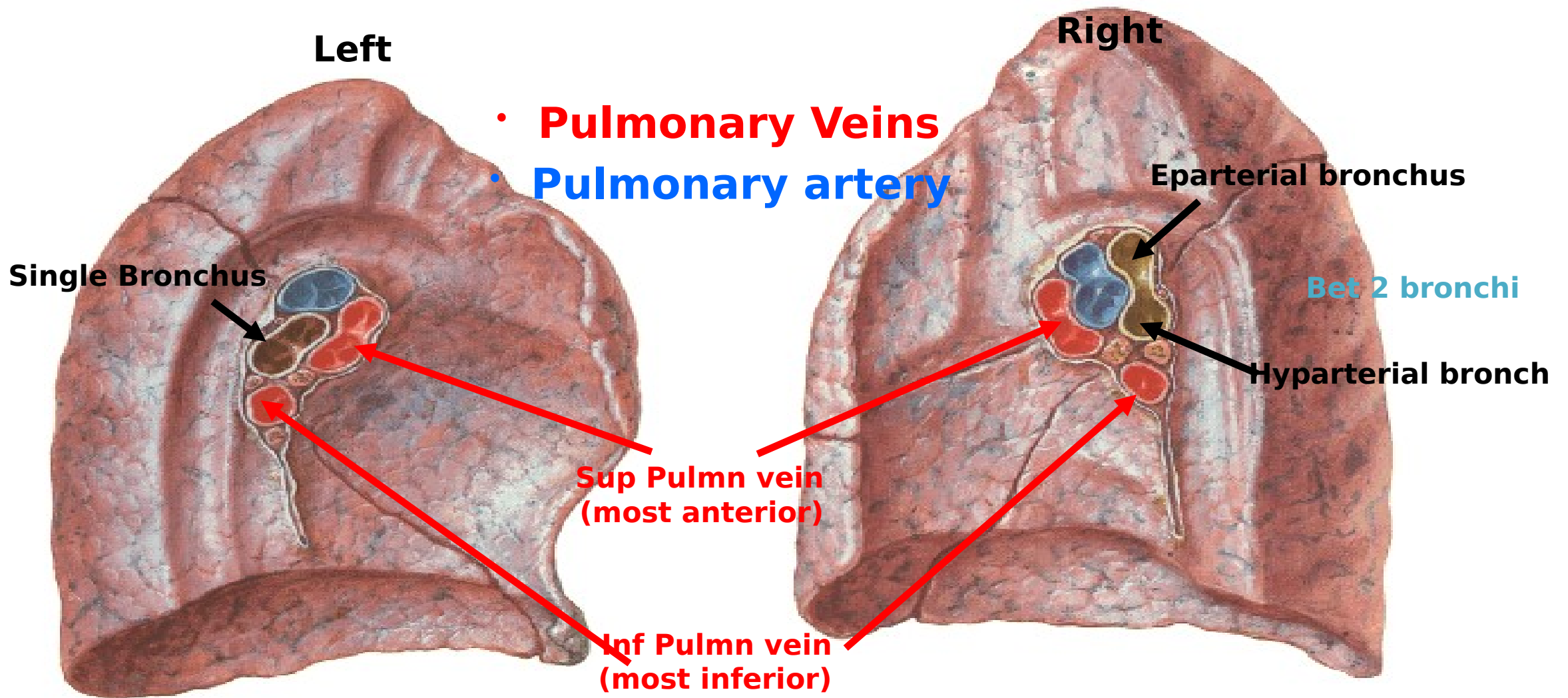
- **The root** of each lung consists of structures passing to and from the lung to mediastinum  
These **structures are:**
- **Pulmonary arteries.**
- **Pulmonary veins (Sup & Inf)**
- **A main bronchus.**
- **Bronchial vessels.**
- **Nerves and lymphatics.**
- **Ant, post pulmonary plexus**







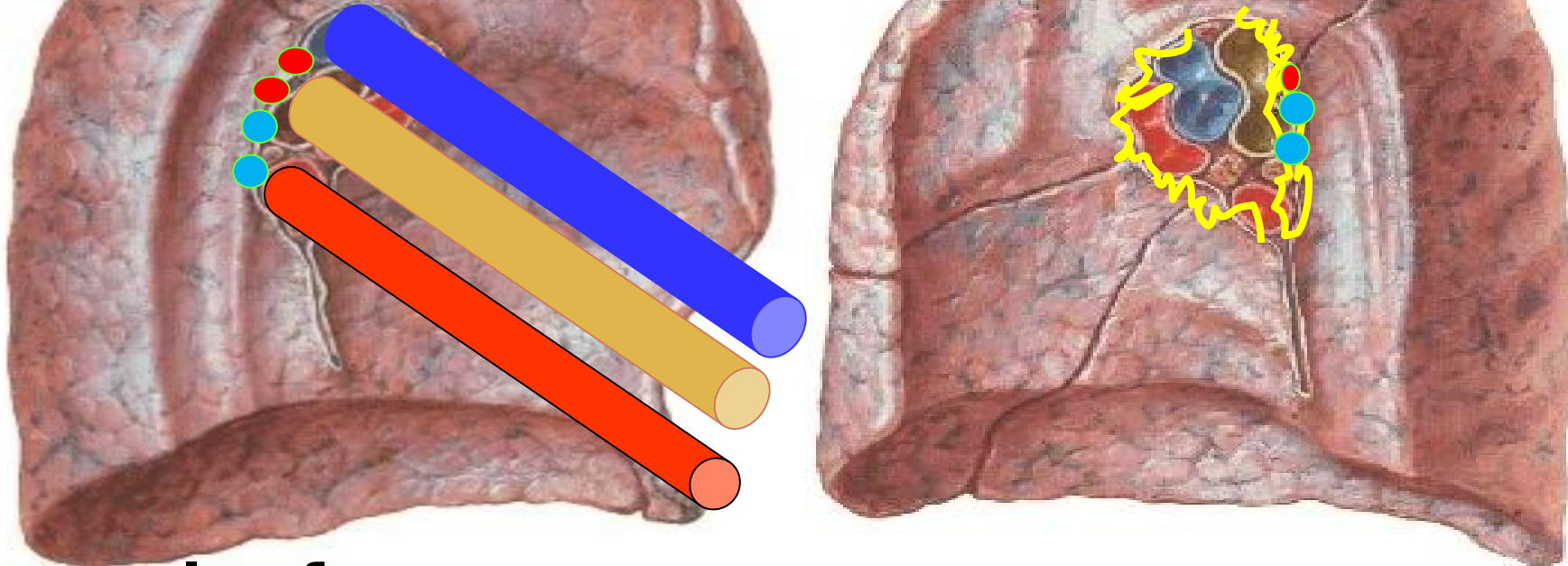
- On the right side, the bronchus to the superior lobe branches before entering the hilum of the lung.
- On the left lung it branches within the lung itself.
- On the pulmonary artery is superior at the hilum, the pulmonary veins are inferior, and the bronchi are posterior in position.



**Lt.**

**Rt.**

Atlas of human anatomy by Frank H. Netter, 6th Edition



## Blood supply of

### lung:

- **The bronchial arteries** 2 in Lt lung (from desc. aorta) & 1 in Rt lung (from Lt sup bronchial or 3rd Rt post intercostal)
- **The bronchial veins** 2 on each side join azygos vein (Rt lung) & hemiazygos or left superior intercostal vein (Lt lung).



# ***Nerve Supply and Lymphatics***



**Nerve Supply:**

**From Ant. & Post. Pulmonary plexuses**

**Parasympathetic:**

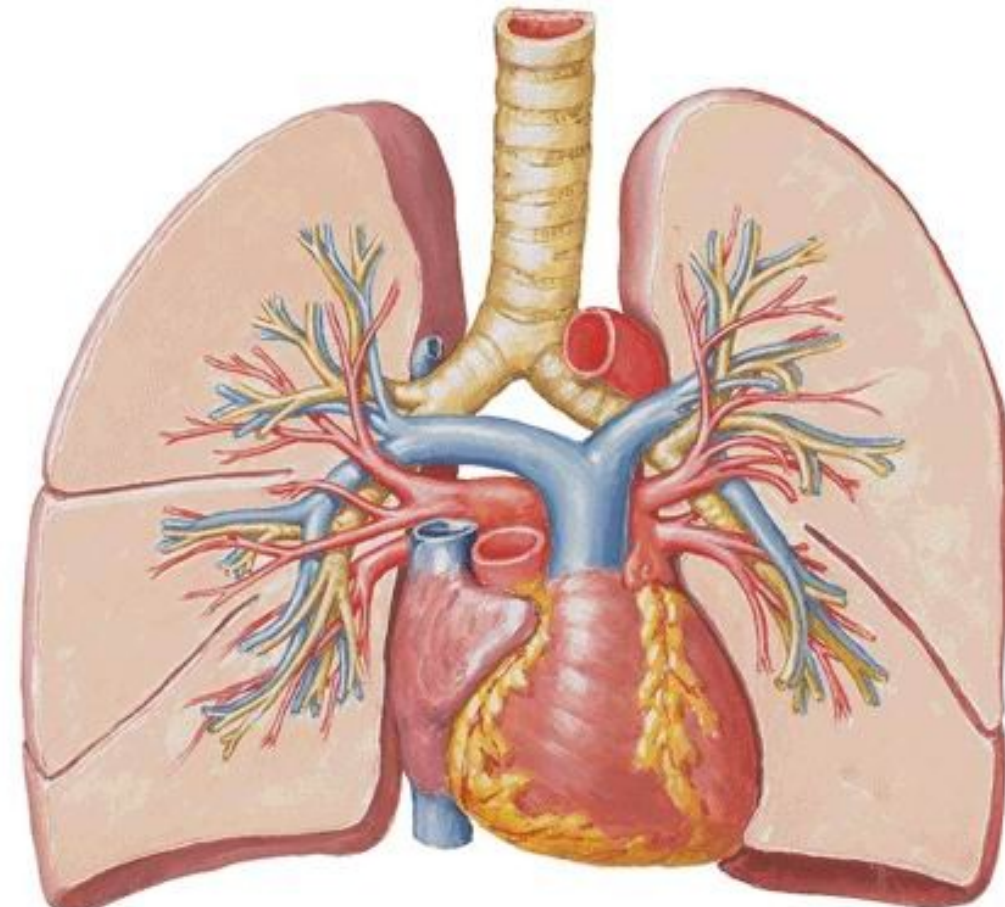
***Smooth ms of bronchial tree  
(bronchoconstriction)***

***Glands (secretomotor)***

**Sympathetic:**

***Smooth muscles of bronchial tree  
(bronchodilatation)***

***Vasomotor to blood vessels***



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# Bronchopulmonary Segments

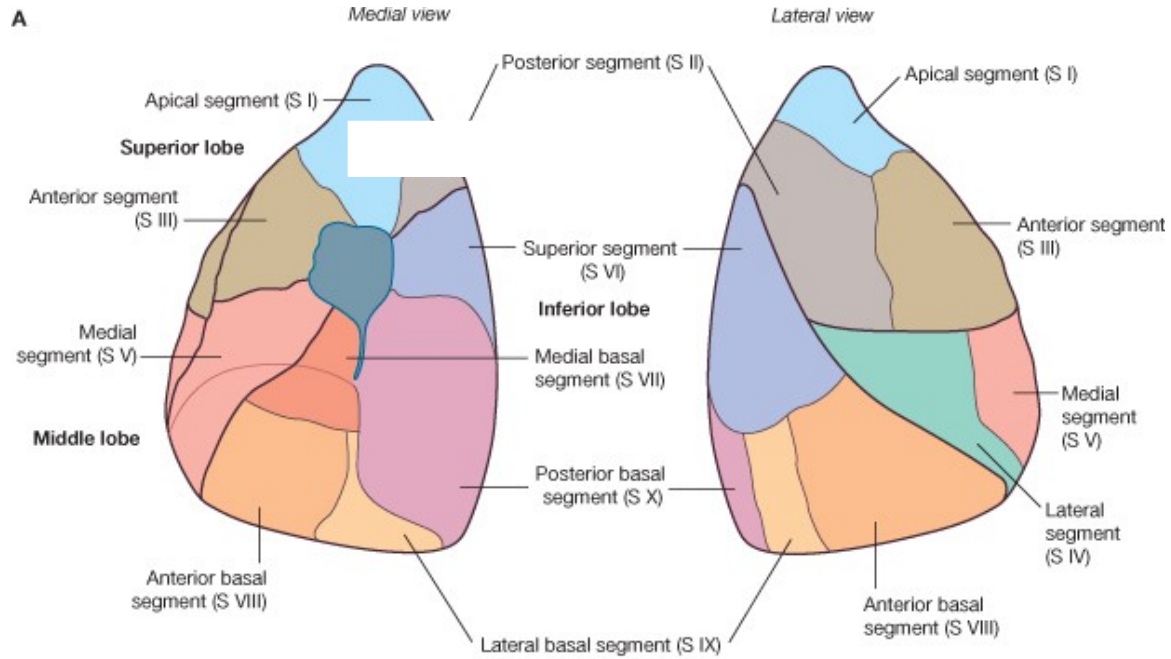
Definition : A bronchopulmonary segment is the area of lung supplied by a segmental bronchus and its accompanying pulmonary artery branch. *They are separate anatomical, functional and surgical units of the lung*

## *Characteristic features:*

1. Each bronchopulmonary segments is *pyramidal* in shape the apex directed toward the hilum base projected peripherally onto the surface of the lung.
2. Segmental bronchus with bronchial vessels and branch of pulmonary artery.
3. *Bronchopulmonary segment is the smallest, functionally independent region of a lung and the smallest area of lung **that can be isolated and removed without affecting adjacent regions.***

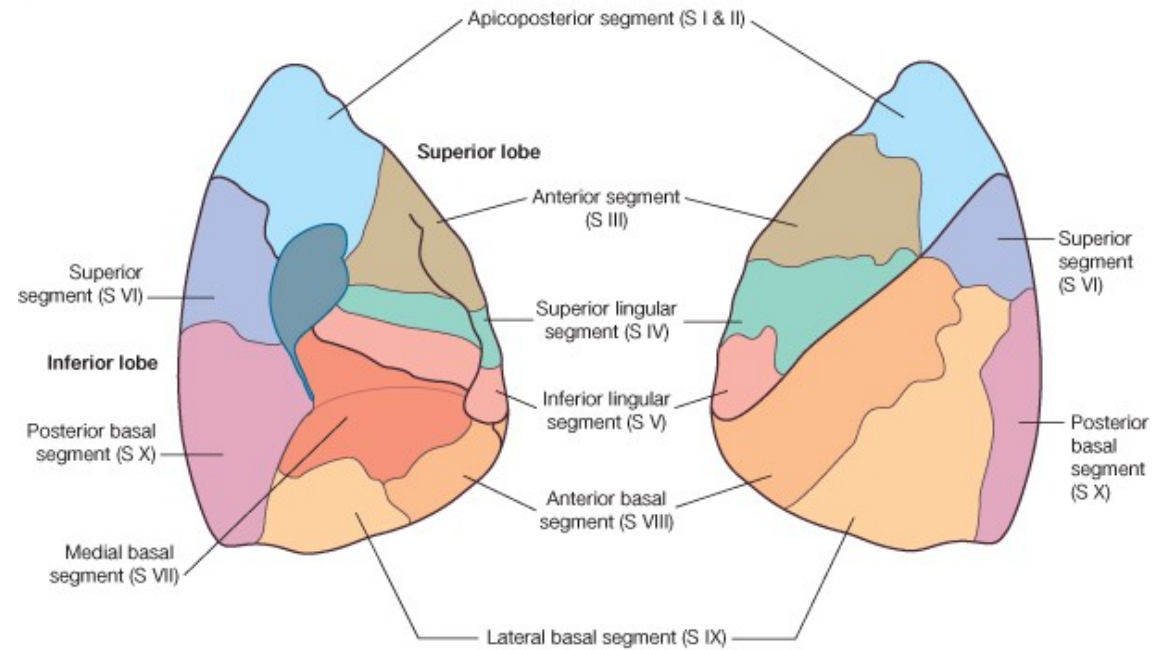


**A**



## ***Right Bronchopulmonary Segment***

**B**



## ***Left Bronchopulmonary Segment***

# ***Right Lung Surface Anatomy***

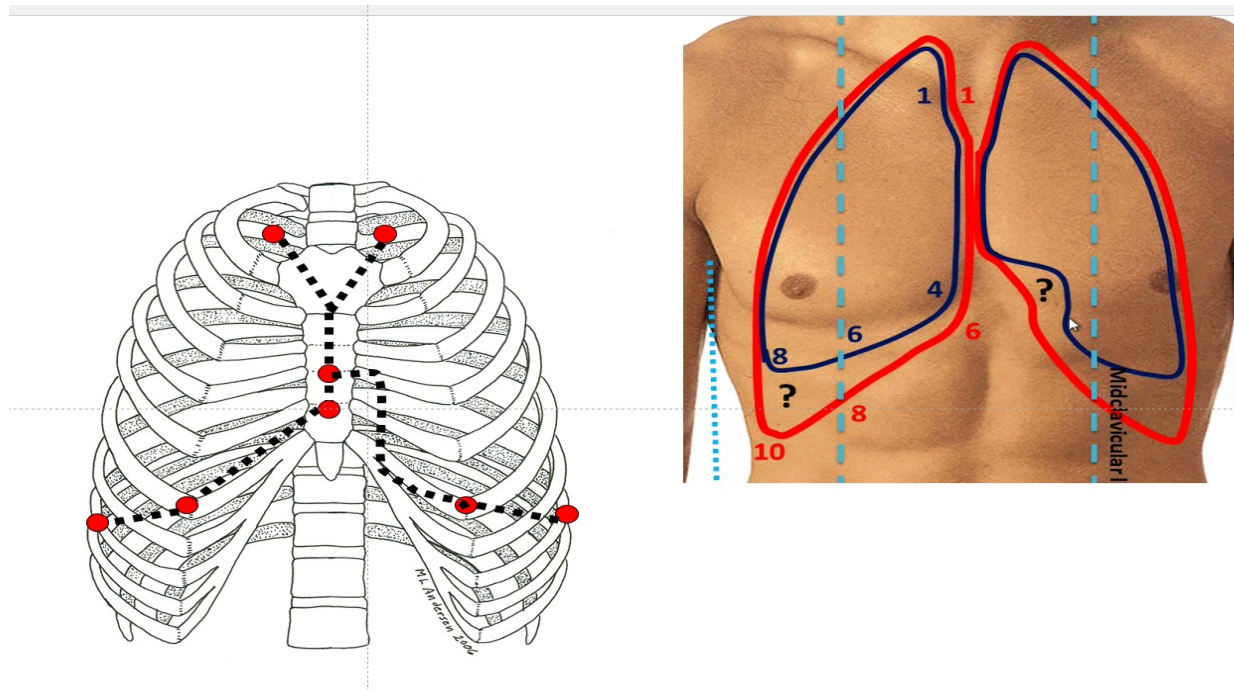


- Apex is represented by a curved line 1 inch above medial end of clavicle towards sternoclavicular joint.
- From sternoclavicular joint to median plane at sternal angle.
- Leaves sternum at 6<sup>th</sup> costal cartilage for the right side.
- At 6<sup>th</sup> rib at midclavicular line.
- At 8<sup>th</sup> rib at midaxillary line.
- At 10<sup>th</sup> rib at scapular line.
- Ends opposite T10 by ascending towards the apex again.

# Left Lung Surface Anatomy



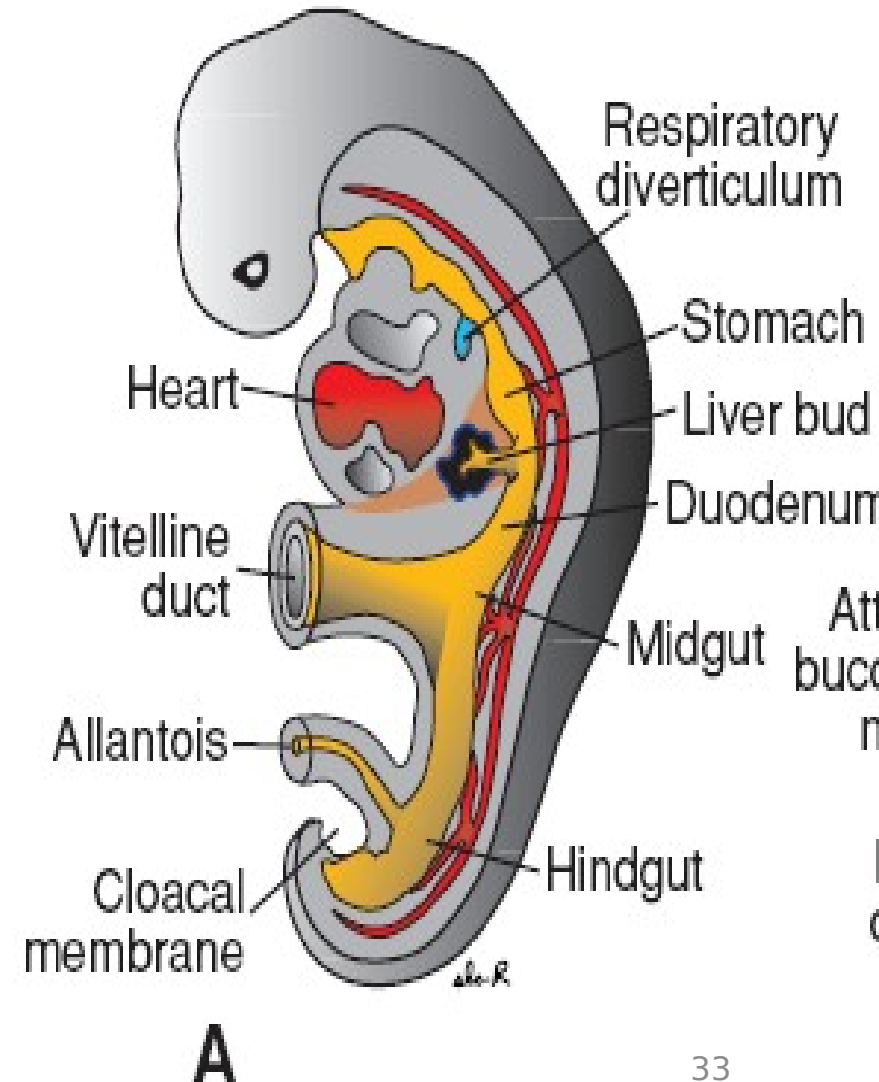
- **Same as right lung except:**
- Cardiac notch begins at 4<sup>th</sup> costal cartilage.
- Descends till the 6<sup>th</sup> costal cartilage and completes like the right lung.

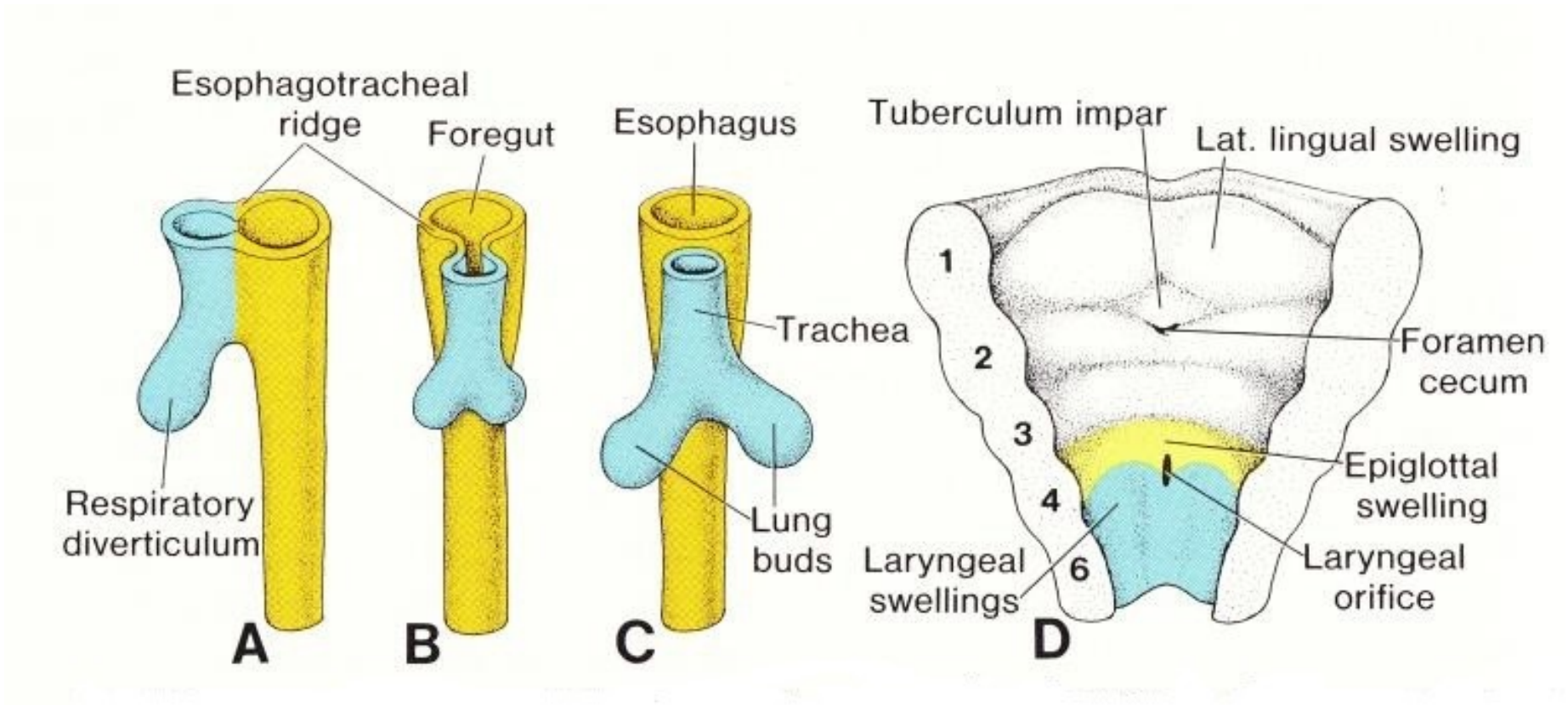


# Development of the Respiratory System

## Respiratory Diverticulum

- At 4 weeks old, the **respiratory diverticulum (lung bud)** appears as an outgrowth from the ventral wall of the foregut.
- When the bud expands caudally, two longitudinal ridges, the **tracheoesophageal ridges (septum later)**, separate it from the foregut
- **Its proximal part** forms **larynx & trachea**.
- **Its distal end** divides to give rise to **2 lung buds**

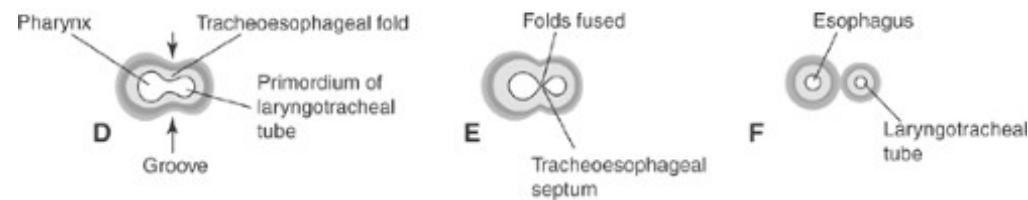
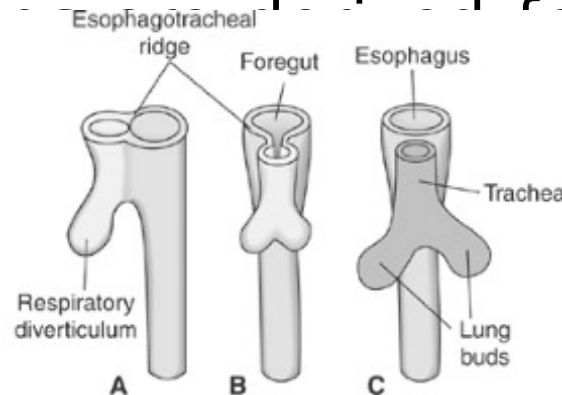




# Respiratory Diverticulum



- The **epithelium** of the internal lining of the larynx, trachea, and bronchi, as well as that of the lungs, is entirely of **endodermal origin**.
- The **cartilaginous, muscular,** and **connective tissue** components of the trachea and surrounding the

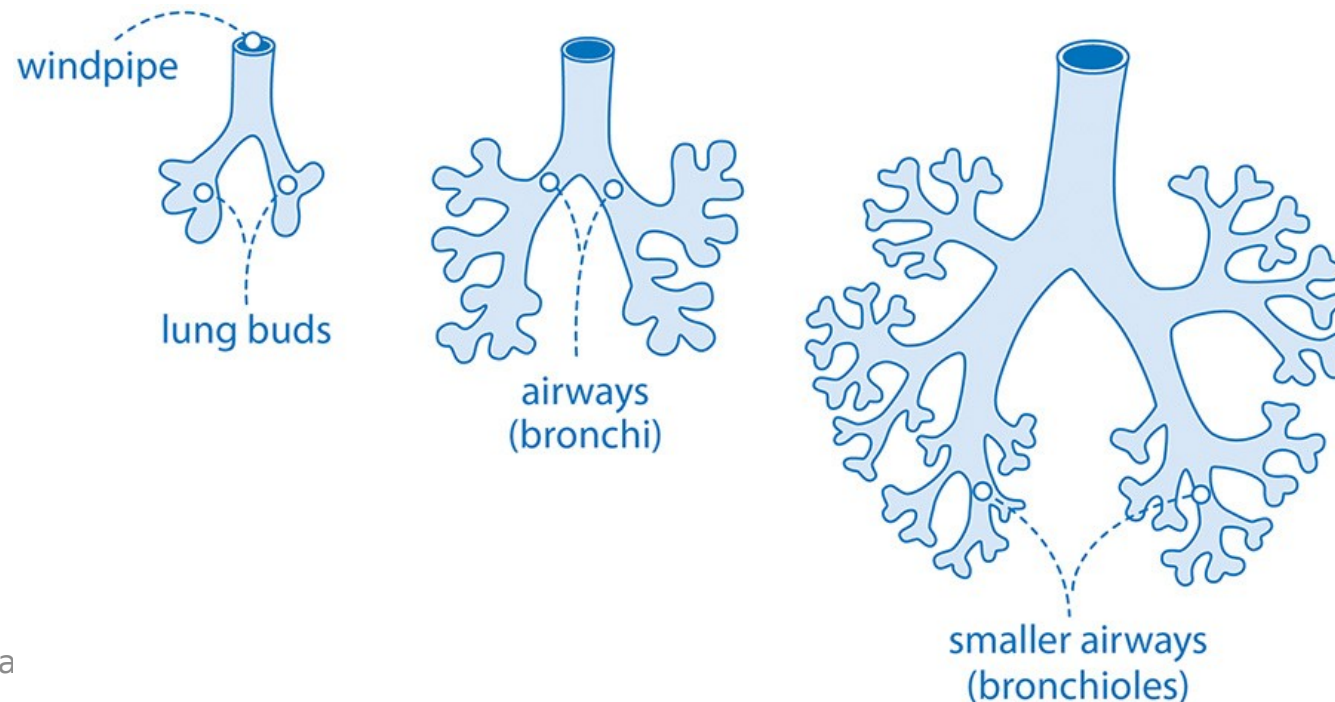




# Trachea, Bronchi, and Lungs



- The **right bud** then forms **three** secondary **bronchi**, and the **left bud forms two**
- **Thus, there are three lobes on the right side and two lobes on the left.**

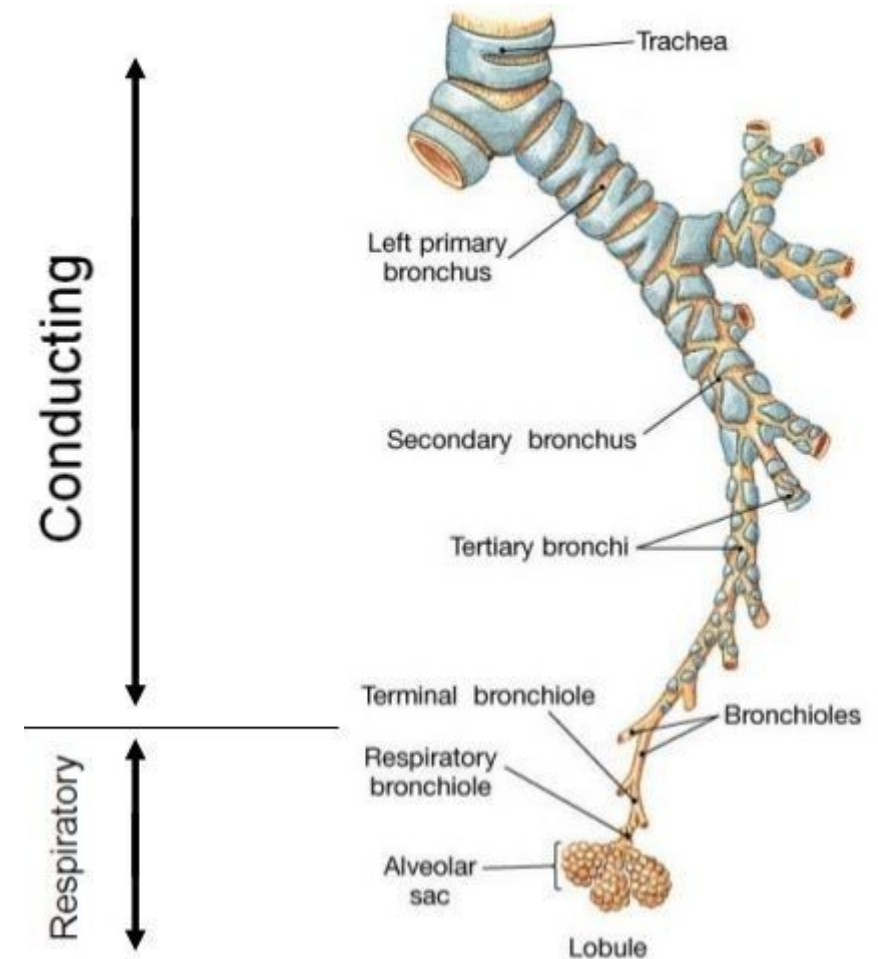




# Development of the Respiratory System

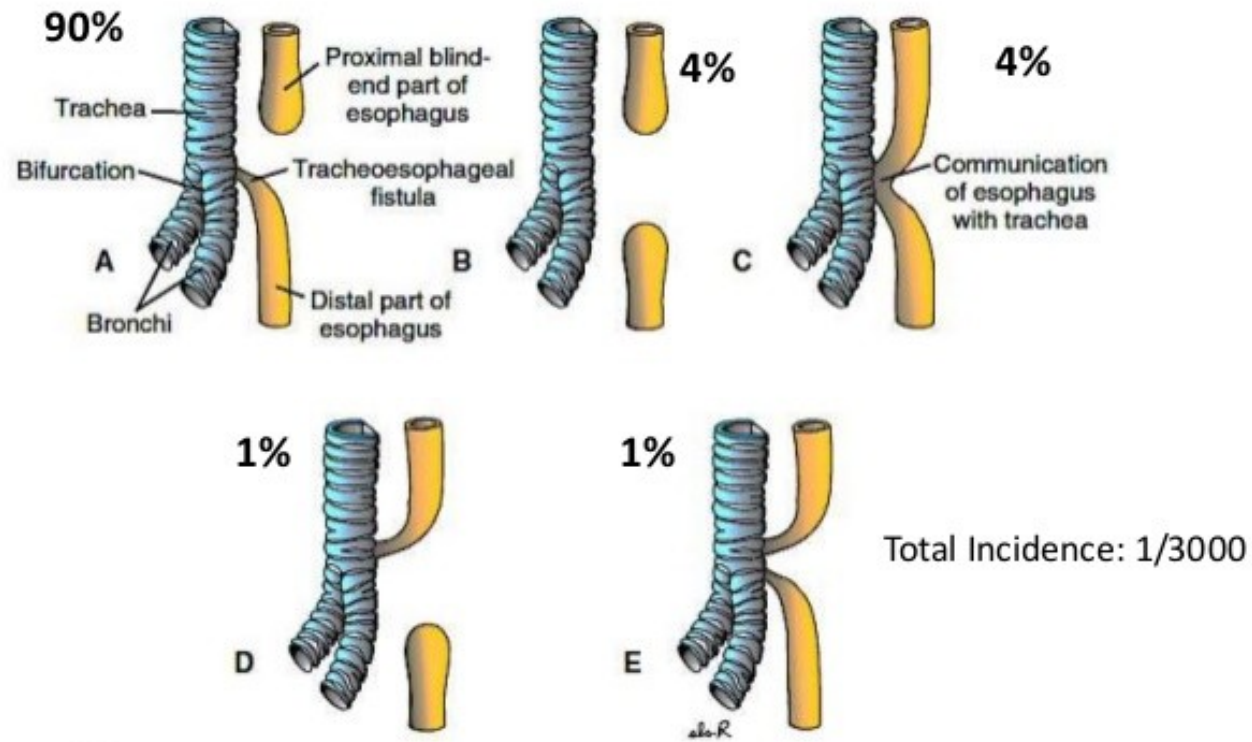


By **6<sup>th</sup> month**, about 17 orders of branches have formed ending in **respiratory bronchioles**, then **after birth alveoli** is formed



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## Defects in partition of foregut esophageal atresia / Tracheo-esophagal fistula

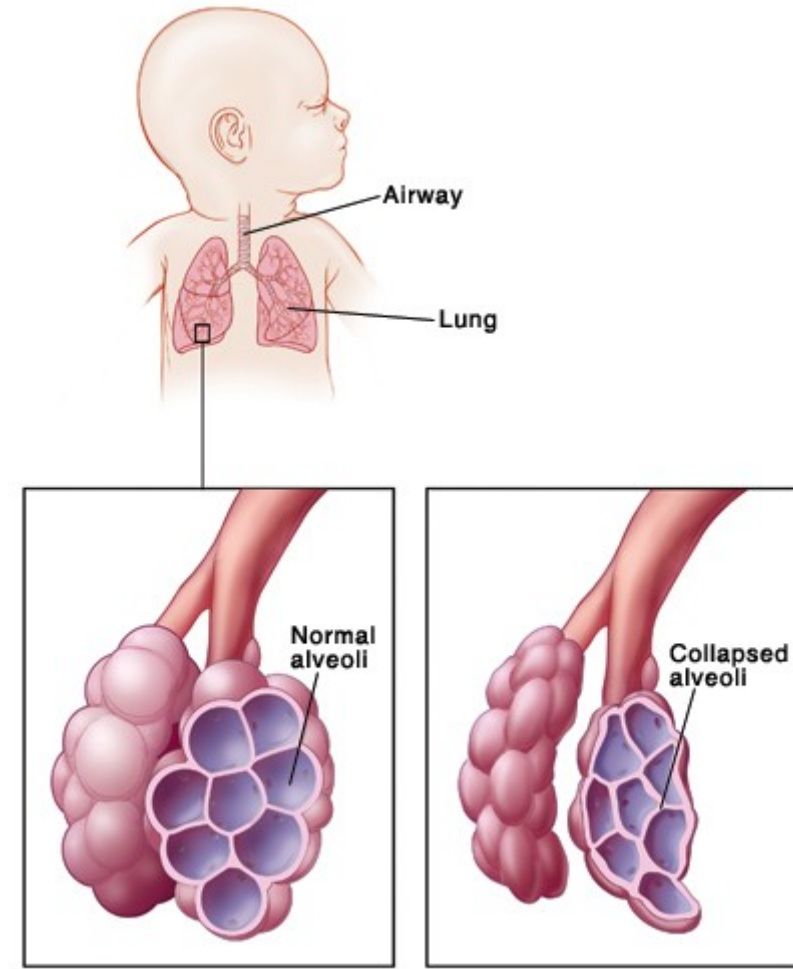


Abnormal communication between trachea and oesophagus due to improper division of foregut by tracheoesophageal septum

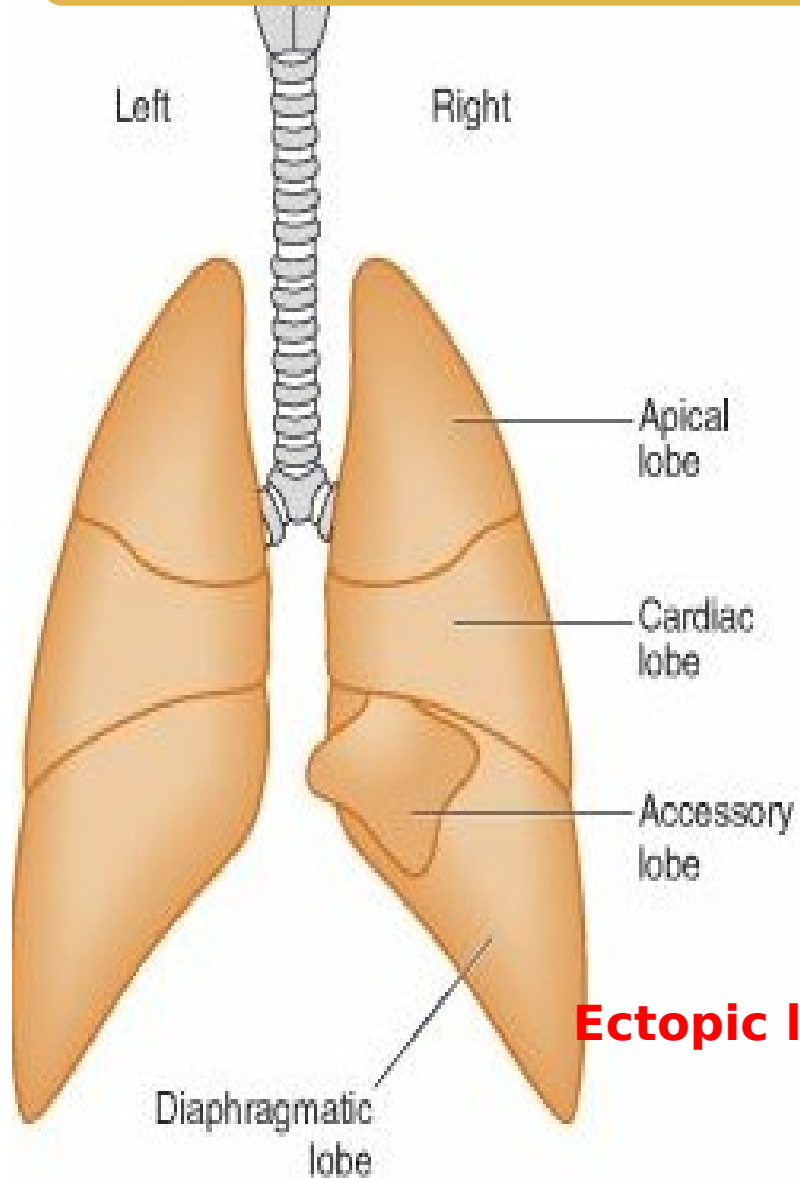
# ***Congenital Anomalies***

## ***Neonatal Respiratory Distress Syndrome (NRDS)***

The disease is mainly caused by a lack of surfactant which helps the lungs fill with air. Surfactant is present when the lungs are fully developed.



# ***Congenital Anomalies***



**Ectopic lung lobes**

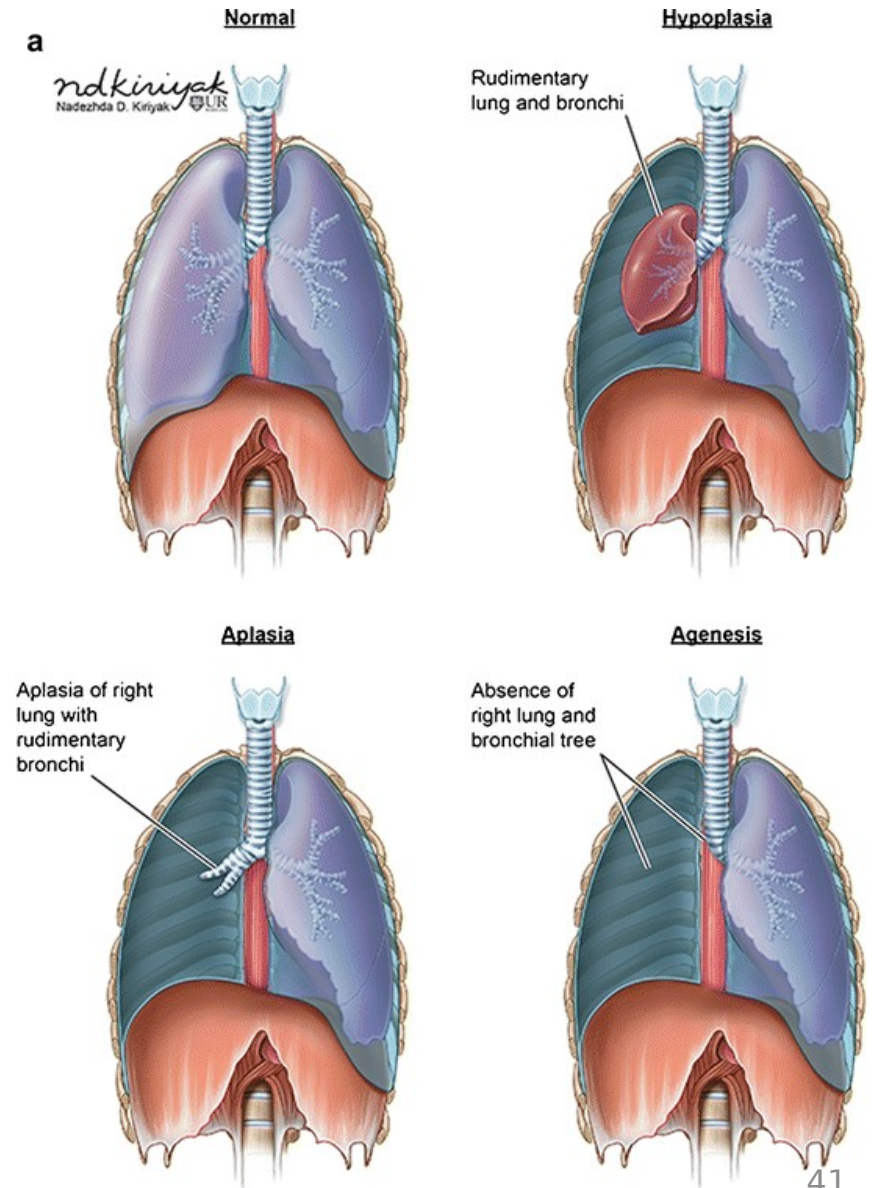
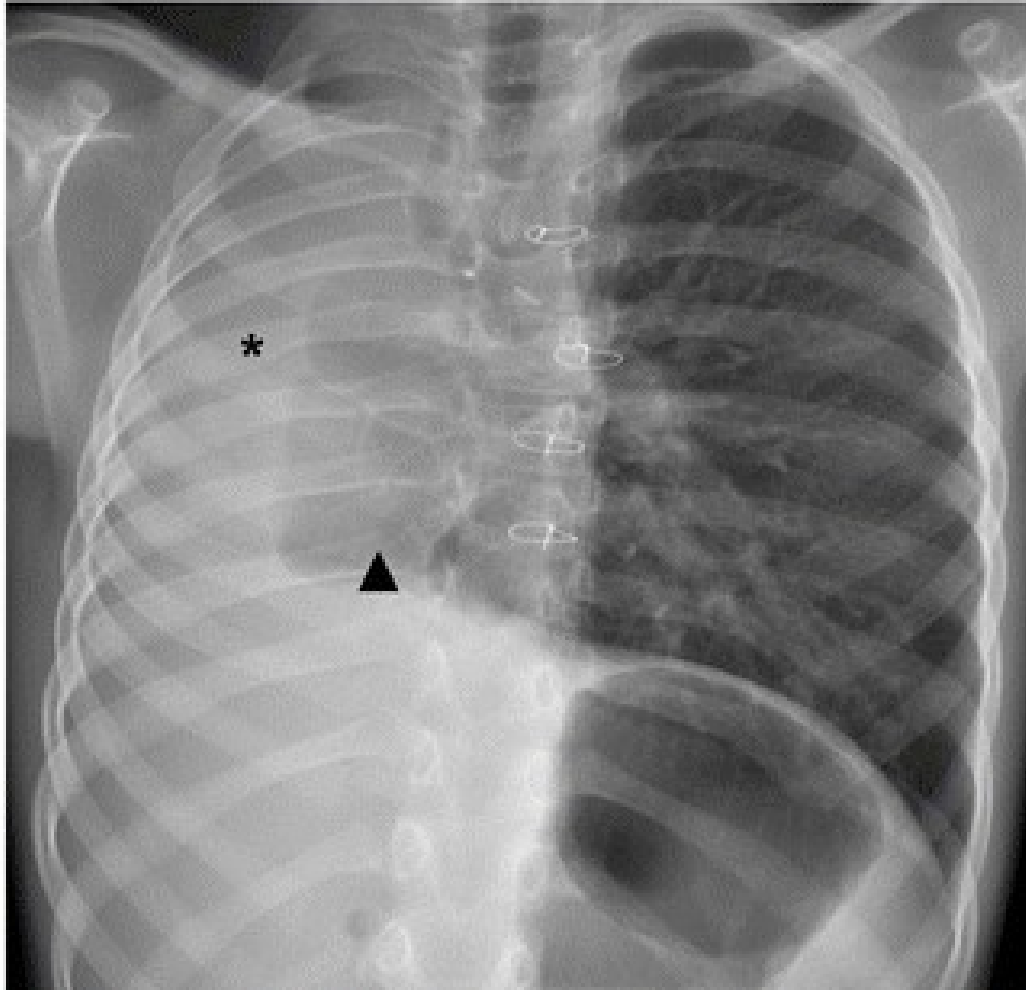


***Solitary or part of polycystic lung disease***



# Lung Agenesis and Hypoplasia

b





# ***Lecture Quiz***



• **Development of respiratory system starts at:**

**A. 3<sup>rd</sup> week**

**B. 4<sup>th</sup> week**

**C. 5<sup>th</sup> week**

**D. 6<sup>th</sup> week**

## ***SUGGESTED TEXTBOOKS***

- Clinical Anatomy for Medical Students.  
Richard S. Snell
- Gray's anatomy for students .

*Thank You*